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VIEWS, NEWS AND INTERVIEWS

"The ELECTRICAL REVIEW has taken just pride in printing the achievements of electrical men in emergencies," remarked an old subscriber. "But I want to tell you what the chief engineer, a steam and mechanical engineer, did when 700 tons of coal in a Brooklyn street railway power house caught fire. The coal was stored in pockets in the top of the building, and something, probably spontaneous combustion, set it afire. An alarm was sent in and a contingent of the fire department arrived on the scene. The chief engineer didn't get rattled and didn't lose his nerve, but devoted his energies for the time being, to keeping the firemen and their hose out of the plant. You know water is bad for electric railway generators, and the chief didn't see how he could have a lot of firemen squirting streams on coal in the top of the building, the water running down on the generators, and at the same time keep the plant running. So he barred out the firemen, opened wide the coal chutes, and as fast as the burning coal arrived on the fire room floor he had it shovelled into the furnaces where it belonged. The coal that was not burning was piled at one end of the fire room, and as rapidly as possible was placed on the conveyors and carried up to the pockets again. This process was continued until all the burning coal had been removed from the pockets, and not a boiler, engine or generator was shut down for a minute. I call that good emergency work, don't you?"

"I witnessed a really astonishing exhibition of coolness and presence of mind the other day," said a New Orleans insurance man to a newspaper man. "Some workmen were removing an overhead wire on upper Prytania street, when one end of it broke loose and dropped down to the pavement. It doubled into a sort of loop as it fell, and, by a singular chance, it completely encircled a young man who was passing, without, however, touching him anywhere. Some people were standing in a near-by doorway, and immediately yelled, 'Live wire!'

"Nine men out of ten would have lost their heads entirely under such circumstances, but this young chap was as calm as a Summer morning. The wire was wriggling all around him, like an immense snake, and threatened every moment to strike him on the legs, but he made no effort to jump. On the contrary, he stood perfectly still, puffing away at a cigar he had been smoking as he came along, and presently, when he saw an opportunity, he sauntered quietly out of the open end of the loop, as unconcerned, to all appearances, as a man walking out of a drawing room. I was on the opposite side of the street at the time the thing occurred, and I must confess it made my hair bristle on my head. I ran across and couldn't help remarking to the young man that I admired his pluck. He laughed. 'Oh! that's all on the surface,' he said. 'I'm dripping with sweat and am really scared half to death.'

"I would like to round off this story by saying that the wire was carrying enough current to kill an elephant, but the truth is that it was not connected at the time, and was as harmless as a piece of clothes line. Still, that was something nobody knew for half an hour, and I insist that it has no bearing on the real merits of the case."

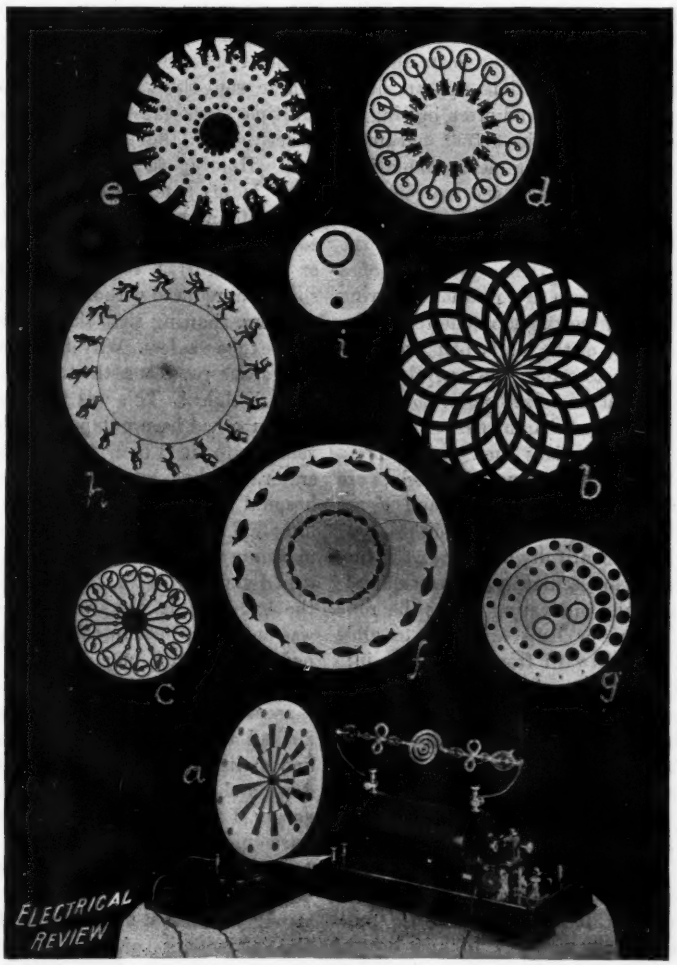


FIG. 1.—"INDUCTION-COIL EXPERIMENTS"—DISKS FOR SECURING OPTICAL EFFECTS.

INDUCTION-COIL EXPERIMENTS.

INSTRUCTIVE AND ENTERTAINING PHENOMENA EASILY EXHIBITED.

BY HOWARD B. DAILEY.

Taking advantage of a well-known peculiarity of our visual function, whose manifestation, "persistence of vision," is due to the temporary retention of the retinal image after the removal of its cause, the experimenter in electrophysics is enabled to produce with great perfection many curious optical effects, which are always interesting and entertaining. The singular spectacle of a circular saw really revolving at full speed, but having every appearance of being absolutely at rest, with all its teeth distinctly visible, is one easy of demonstration by any one having an induction coil and a small electric motor. Fig. 2 shows the arrangement of apparatus for this experiment. At the left is seen a rather coarse-toothed buzz saw, six or eight inches in diameter, cut out of thin sheet brass or zinc and mounted upon the spindle of a small motor which is driven at a high speed by the battery B. A separate battery, not shown in the illustration, operates the coil, whose regular circuit-breaker is thrown out of action by moving the platinum-pointed screw permanently out of contact with the vibrating spring. Wires are attached to the interrupter posts and led to the binding-screws of a special interrupting device in the rear of the saw motor and actuated by it. This consists of a short piece of watch spring, mounted at the top of a stiff wooden post, attached to the motor base. The spring bears lightly against a platinum-pointed contact-screw placed below it. The motor shaft is prolonged posteriorly, terminating in a short crank which engages the end of the spring, lifting it out of contact and breaking the primary circuit of the induction-coil once for each revolution of the saw. It is evident that with such an arrangement the occurrence of the light flashes must exactly synchronize with the revolution of the motor, regardless of any variation in

its speed; the result being that in a darkened room the swiftly moving blade appears to stand perfectly still, ith every tooth and mark upon its surface as plainly visible as if it were actually at rest. The fine print of a scrap of newspaper pasted upon its face may be easily read with the saw running at 2,000 revolutions per minute. To prove that it is really in motion small raw potatoes may be readily sliced with it, and it is indeed a novel sight to see such objects drop in two when held *between* the apparently stationary teeth. In working up this experiment the light from a Geissler tube was first tried but was found inferior to that of the naked spark, owing to a phosphorescence of the glass which, lasting an appreciable time after each discharge, interferes materially with the clearness of the effect by prolonging the duration of the flashes. A small Leyden jar, J, with its inner and outer coats connected, as shown with the terminals of the secondary wire, adds greatly to the brilliancy of the spark which is still further assisted by the white cardboard reflector, R. The front face of the saw may with advantage be painted white.

By the use of whirling disks having various figures upon them, viewed by the intermittent light of the induction coil, many curious optical effects are obtained. In Fig. 1 are seen a few examples of these disks. The motor used in the previous experiment may be advantageously employed to revolve them. A Geissler tube is used and the coil has its regular interrupter brought into action, since the occurrence of the light flashes must be made independent of the speed of rotation of the card; the many different appearances of the same disk being dependent upon the varying relation between speed of revolution and rapidity of discharge. The disk *a*, seen in position upon the motor at the left of the induction coil and the tube, was taken from Hopkins's "Experimental Science." It provides one of the best of this class of illusions, and to the principle of its design is due the credit of suggesting ideas for a large number of pleasing forms. It has an outer and inner set of radial bars, the outer having twelve and the inner thirteen bars, while upon a circle eccentric with the centre are drawn twelve equally spaced dots. When in operation the two sets of bars appear to revolve slowly in opposite directions, and it is with difficulty that the observer persuades himself that they are really fast to the face of the card. Again, as the speed of the motor changes (the coil interruptions remaining constant), one set remains stationary while the other slowly advances, or both sets seem to turn at different speeds in a direction contrary to that of the known motion of the card; the dots describing small circles of their own. Upon a like plan the disk *b* is made, consisting of two sets of broad equidistant curved lines, tapering to points at the centre, and bent in opposite directions; the sets having fifteen and sixteen lines respectively.

It would be impossible to describe the great variety and beauty of the figures this card produces. As the speed changes most intricate and unexpected combinations appear, all in graceful motion and often bearing no resemblance to the actual markings. In *c*, *d*, *e* and *f* are seen adaptations of the principle of the zoetrope and kinetoscope to the induction coil. As will be observed by a study of the pictures upon them, each one of a series is drawn in a position differing slightly from the next one following, the speed of the motor being so regulated as to cause the arrival of the figures at any fixed point to synchronize with the light flashes from the tube. The disks then seem to be at rest while the pictures themselves are in life-like motion. C and *d* are mechanical movements, and the latter, which beautifully illustrates the motion of an oscillating steam engine, is especially interesting. In *e* the rows of dots or balls are seen to glide slowly outward from the centre into the snapping jaws of the hungry dogs who swallow them voraciously. Reversing the motion causes the animals to disgorge their feast; the balls passing back again and disappearing in the centre. The dots are drawn at the intersections of a spiral and 18 straight radial lines entering the mouths of the dogs' heads, which being located upon an eccentric, push themselves savagely in and out at each revolution. The vigorously switching tails and wriggling bodies of the chubby fishes in *f* are highly amusing. G produces alternate contractions and expansions of the black dots, while the frantic dance and furious gesticulations of the figures on *h* never fail to provoke mirth. In the small disk *i* several dots with circles surrounding them are frequently seen. The effects here mentioned are only a few of the great variety of which such disks are capable. The lover of scientific recreation who will prepare them for himself will recognize them as among the best of induction coil accessories, and will find much enjoyment in the curious changes taking place in the appearance of any particular disk at each disturbance of the relation between the velocity of rotation and occurrence of the light flashes.

NOTES ON LIGHT.

BY WILLIAM ROLLINS.

NOTE LXXII—THE POWER OF HARMONICS.

I had a tube like the one shown in Fig. 56, Note lx, and attached it to the generator mentioned in Note lxvii. The spark gap in shunt was opened to fifteen inches, but no discharge went through the tube. Two multiple spark gaps were then placed in series with the tube, one on each end. Holding the cords controlling these in my hands, I adjusted them until I found a rate of surging which caused the tube to light up. As soon as this occurred the spark gap in shunt was reduced without the current crossing, showing that the resistance of the tube was less. Why did the multiple spark gaps cause the tube to generate X-light? This was the reason. The tube had been pumped to a high vacuum to fit it to a powerful generator. It had been used in a large hospital until the generator could not light it. I lowered the vacuum with the platinum regulator the day before, but it had gone up again. Evidently all the hydrogen in the cathode, which was not firmly held by the aluminum, had been driven out and used up, until an electric pressure sufficient to cause a spark to jump 15 inches of air had no power to send out more and so light the tube. By running down and up the scale of the electric surges, I found a rate which was an harmonic—a natural period of the hydrogen particles—which therefore were thrown into a stronger and stronger vibration until escaping from the attractions of the aluminum particles they rushed out striking the target with a high velocity and producing X-light of great penetrating power, for we could see our hearts at a distance of 30 feet from the tube. After observing the tube for half an hour the spark gaps in series were closed. The spark gap in shunt was reduced to measure the resistance of the tube which was found to be less than a tenth of an inch. The color was deep blue, the Varley stream and the target reflection both white and there was no X-light. This showed that the short period of running had forced a great number of particles into the circulation. The experiment also showed the importance of the statement made in Note xxxix, that a high potential was desirable in a generator for lighting X-light tubes.

NOTE LXXIII—MASSIVE CATHODES.

Until I introduced a different type the object of tube makers was to have the tubes as small as possible and with very light terminals. The anode was made of a small piece of platinum foil, and the cathode of a small and thin disk of aluminum supported by so small a stem as to require glass support. In Fig. C, Note xviii, I showed a massive cathode, and in later notes strong tubes properly proportioned to bear the force from powerful generators, and with cathodes of sufficient mass to serve as reservoirs of hydrogen. This is a matter of practical importance in tubes for hospital work, where the tubes are often kept lighted for many hours in a day. Under these conditions a light cathode would soon show signs of exhaustion. With massive cathodes I have frequently kept a tube lighted by a powerful generator without any signs of fatigue appearing after ten hours' run.

NOTE LXXIV—X-LIGHT A HYDROGEN PHENOMENON.

Scattered through these notes are various experiments and statements showing how X-light is produced. Briefly this is the way: Particles of hydrogen come rushing out of the cathode, bang against the target, are heated and so vibrate, throwing the ether into waves unlike those of ordinary light, because of higher pitch and shorter trains quickly diminishing in frequency and amplitude, because the particles are so small they lose heat rapidly. Few, however, believe me, so in a few notes some simple experiments will be mentioned, which I venture to ask those who hold other theories to consider.

Place a tube on the pump and exhaust it until it produces no X-light. Then is a good time to stop and consider some of the ether theories, which are that cathode and X-rays are portions of the ether, either of the vortex ring or other type coming from the cathode. In Note lxix, I showed an experiment which was against this theory, as it appeared to indicate that X-light penetrated into the geometrical shadow. In the present experiment we have to consider in what way the cathode has

been changed when X-light is no longer produced. If X-rays were portions of the ether shot out from the cathode and there came a time when we got no more X-rays, we should be justified in thinking we had reduced the amount of ether in the cathode.

Also, if the experiment showed that ether had been driven out of the cathode, the only thing required for the production of X-rays again would be rest, to allow the ether to go back again, but you could let such a tube rest until doomsday and it would not make the faintest spark in the universal gloom. As I did not feel competent to achieve so easily such a wonderful result, I preferred to believe that what I had done was only to reduce the supply of hydrogen in the cathode until a condition of equilibrium had been reached between the electric stress and the attraction of the remaining hydrogen for the aluminum. Therefore we should not expect rest alone to enable a tube to generate X-light again, but we should expect fresh supplies of hydrogen to produce this result, and behold it was only necessary to use the electrolytic regulator figured in Note lxii to get brilliant X-light again.

NOTE LXXV—DEPTH OF RADIANT AREA.

In Note lxix, Fig. 62, I showed a target anode with a slit. Here let us consider an experiment with a similar slit which is raised a hundredth of an inch above the plane of the target, with the nearest opening one-half inch back from the edge of the raised piece. Excite the tube and look at the image made by the X-light coming through the slit. Then consider the theories of Stokes and J. J. Thomson, which fortunately are now easily accessible, having been reprinted in *Roentgen Rays* by G. F. Barker. Stokes says: "Well, then, this is what I consider to constitute Roentgen rays. You have a rain of molecules coming from the electrically charged cathode, which you may think of as so many rain-drops in a shower. They strike successively on the target, each molecule striking the target producing a pulse, as I have called it, in the ether, which is essentially partly positive and partly negative. The simplest form of pulse, as I call it, in order to distinguish it from a periodic undulation, would be one consisting of two halves, in which the disturbances were in opposite directions. The positive parts are not necessarily alike, as one may make up by a greater width measured in the direction of propagation for a smaller amplitude, it will be simplest to think of them as alike."

Thomson says: "Thus we see that the stoppage of a charged particle will give rise to very thin pulses of intense magnetic force and electric intensity. Two pulses are started when it is stopped. One of these is a thin sheet, whose thickness is equal to the diameter of the charged particle; this wave is propagated in the direction in which the particle was moving; the other is a spherical pulse, spreading outward in all directions, whose thickness is again equal to the diameter of the charged particle. The theory which I wish to put forward is that Roentgen rays are these thin pulses of electric and magnetic disturbance which are started when the small, negatively charged particles which constitute the cathode rays are stopped." Now, according to Kelvin, the diameter of a hydrogen particle is in the neighborhood of $\frac{1}{10,000,000}$ of a centimetre; therefore, the magnitude of the vibration which would be started in the ether on these theories would not differ much from this measure. To such a dimension the one-hundredth of an inch of platinum, on top of which is our target, would be a vast cliff in whose shadow the slit would be quietly reposing, lighted but dimly, for no portion of the direct rays from the radiant area could enter it fairly; for, according to these theories, the depth of the radiant area at the base of our platinum cliff is only about the diameter of a hydrogen particle. But experiment shows the slit is so brightly lighted that I have got diffraction fringes in half an hour's exposure, and it gives a bright image on the fluoroscope at a distance of two feet, so I prefer my earlier explanation; namely, that the particles of the cathode stream are heated to a very high temperature by their impact on the target. As it takes time for the heat to decline, the particles retain a sufficient temperature, when they have bounced back opposite the slit, to make them still centres from which the ether waves we know as X-light originate, therefore, as the wave fronts can enter the slit directly, this is brilliantly illuminated.

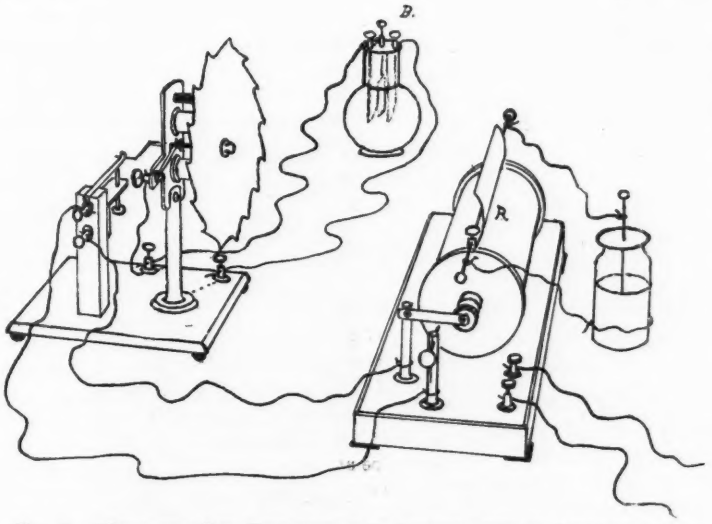


FIG. 2.—"INDUCTION-COIL EXPERIMENTS." ARRANGEMENT OF APPARATUS FOR CIRCULAR SAW ILLUSION. (See page 355.)

AMERICAN BELL TELEPHONE COMPANY.

THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY TO ABSORB THE PARENT CONCERN.

At a meeting of the directors of the American Bell Telephone Company, held in Boston on December 1, it was voted to turn over the assets of the company to the American Telephone and Telegraph Company. This is believed to be the first step in the removal of the American Bell Telephone Company from Massachusetts to New York. President Hudson, of the American Bell Company, authorized the following statement on December 2:

"The substance of the action taken at the meeting of the directors yesterday is that the assets of the American Bell Telephone Company are to be taken over by the Long Distance Company (American Telephone and Telegraph Company). It is to be recommended that two shares of Long Distance Company stock be exchanged for one share of American Bell Telephone Company stock. The balance of $19,000,000 or $20,000,000 of Long Distance Company stock will be held for the benefit of the Long Distance Company."

According to its last annual report, the issued capitalization of the American Bell Telephone Company is $25,886,300. At two shares for one the absorption of the company by the American Telephone and Telegraph Company will require an issue of $51,772,600 of the latter company's stock. A Boston paper stated on Saturday last that the new stock probably will pay 8 per cent, or $16 per year on two shares, whereas at present one share of American Bell receives $15; *i. e.*, $12 regular and $3 extra. This, of course, is merely an assumption. The parties in interest are not prepared to announce the exact dividend rate, nor have they stated when the exchange of stock will be made.

As is well-known the American Bell Telephone Company is the parent concern which controls the various local licensee Bell telephone companies throughout the United States. The American Telephone and Telegraph Company, popularly known as the Long Distance Company, has also heretofore been controlled by the American Bell Telephone Company. Mr. John E. Hudson, of Boston, is president of both companies. The directorate of the American Telephone and Telegraph Company includes, besides Mr. Hudson, the following: Melville Eggleston, secretary; Edward J. Hall, general manager; Edward P. Meaney, assistant general manager; Alexander Cochrane, William D. Sargent, Charles W. Amory and Henry S. Howe. Several of these directors are also associated with other licensee Bell companies. The American Telephone and Telegraph Company was organized about fifteen years ago for the special purpose of providing long-distance lines connecting the exchanges of the various licensee Bell companies. The capital stock, which was at first $5,000,000, was gradually increased to $25,000,000, and a few months ago the board of directors authorized a further increase to $75,000,000.

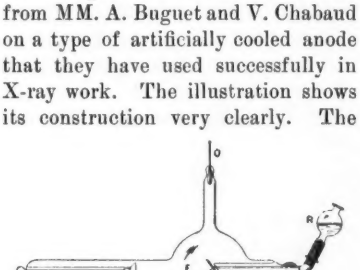
It is believed that the controlling reason for the combination noted above is that the American Bell Telephone Company has been considerably harassed of late by the attempts of the Massachusetts state authorities to place the corporation under state supervision and control, and also by the tax laws of the state.

SCIENCE BREVITIES.

Resistance of Moving Electrolytes—Edlund found in 1875, by two independent methods, that the resistance of a liquid, such as water or a mixture of water and alcohol, diminishes when it moves with the current and increases when it moves against the current. Bosi found the same result to a more pronounced extent in solutions moving at the rate of 11cm. per second as against Edlund's 10m. per second, but only in electrolytes which concentrate at the anode, the effect being the opposite for electrolytes which concentrate at the cathode, and no effect being observed in electrolytes which undergo no concentration. Doubt has been thrown on the whole phenomenon by Hayward's experiments, but A. Amerio has repeated Bosi's experiments, confirmed his observations, and given a very plausible explanation of the effect. He points out that various solutions employed by Bosi all increase in conductivity when concentrated. If the electrolyte concentrates about the anode, and the liquid flows from the anode to the cathode, it is evident that the anodic concentration will be made to affect a larger portion of the liquid in the tube, and the resistance will fall. Whereas, if the electrolyte concentrates about the cathode, the concentrated portion is rapidly washed away by the flowing liquid. Mere motion has no traceable effect, the change of resistance observed being altogether a concentration phenomenon. The above is abstrated by the *Electrician* from an Italian technical journal.

Magnetic Shielding—For a long time it was the custom to use extremely thick iron shells to protect suspended magnetic systems from outside disturbance. The advantage of using concentric shells, separated by non-magnetic interspaces, was pointed out by Rücker and by Du Bois, the former giving a general solution, in spherical harmonics, of the general problem of multi lamellar shielding with spherical shells. Mr. A. P. Wills maintains, says one of Mr. E. E. Fournier d'Albe's abstracts, that the practical advantages of cylindrical shells are much greater than those of spherical shells. Convenient cylindrical shells may be made by rolling up thin sheet-iron strips of proper width, and the same amount of shielding may be obtained as with ten times the material in a single shell. The author gives a mathematical determination of the shielding ratio—*i. e.*, the ratio of the external field to the field within the shield, for the case of infinitely long cylinders—but he also shows that the condition of infinity is closely approximated to in the central portion of a cylinder whose length is not less than three or four times its radius. The best ratio of the two radii of an air space between the shields is 1.5 or 1.6 in case of cylinders, and it is possible, by the use of three shields, to reduce the external field five or six thousand times. The author works out a special case in detail by a graphic method.

X-Ray Tubes with Artificially Cooled Anodes — The French Academy of Sciences publishes a communication from MM. A. Buguet and V. Chabaud on a type of artificially cooled anode that they have used successfully in X-ray work. The illustration shows its construction very clearly. The



X-RAY TUBE WITH WATER-COOLED ANODE.

anode is at the extremity of a large-sized tube of platinum sealed directly in the glass. A little reservior for water is attached to the outer end of the platinum tube, but in case a very high circulation is desired, the platinum tube is made double and water or mercury can be forced to circulate against the back of the anode plate C. It is said that the tube works well under the discharge of most powerful coils without the anode becoming even red-hot, and that the vacuum in the tube does not change during its operation. Similar tubes have been devised in this country by numerous experimenters, but the results so far have not been made public.

Resistance of Amalgams.—Mr. R. S. Willows describes in the *Philosophical Magazine*, the results of some experiments undertaken for the purpose of investigating the alteration in the electrical resistance of amalgams with temperature. Among the amalgams tested were those of zinc, tin, cadmium and magnesium. Cadmium and tin amalgams showed a sudden rise in resistance at about 95 degrees; the resistance remaining higher after cooling than it had been at the same temperature before heating. Zinc amalgams show a very extraordinary behavior. Most of them yield curves in which the resistance rises gradually at first with the temperature, then more slowly, after which there is a sudden drop in the neighborhood of 65 degrees, and then another gradual rise. On cooling, there is a gradual fall, which continues nearly in a straight line down to 20 degrees or 25 degrees, after which there is a somewhat sudden rise. The author supposes that the amalgam consists of a mixture of several different compounds of mercury and zinc, together with zinc and mercury in the free state. At 36 degrees one of these compounds melts, and at a higher temperature we reach the melting point of another, which causes the sudden drop of resistance. On cooling, the liquid which has the higher melting point persists down to a certain point at which the whole mass becomes solid.

Charge Indicators for Accumulators—Before the Royal Academy of Sciences, in Padua, Italy, Signor M. Bellati recently read a paper on the above subject. The method that he suggested is as follows: He puts on the cell of the accumulator to be tested a vertical glass tube, something like a boiler feed-water indicating glass, and in this floats upon the top of the electrolyte some liquid which is lighter than it and does not mix with it, such as kerosene oil, for example. At the base of this tube is blown a bulb. The small variations in density of the electrolyte, as the charge increases, are magnified greatly in the movement of the lighter liquid in the upper part of the tube, and, as this can be furnished with a scale, the total charge can be read at any time by reference to the height of the liquid column.

Wireless Telegraphy in the Alps—In a note to the French Academy of Sciences, presented by MM. Jean and Louis Lecarme, they describe the results of experiments with wireless telegraphy, where the stations were not only separated by a considerable horizontal distance, but also where they were very different in altitude, and one at least of them in the high regions of the atmosphere. Experiments were made between Chamiounix at an altitude of 1,000 metres, and the Vallot observatory, 12 kilometres away in a direct line and at an altitude of 4,350 metres. The equipment of the two stations was of the usual variety, the earth at the upper station being made of an iron post driven into the hard snow. It was found necessary to separate the poles at the spark gap at least two centimetres to obtain good results. Clouds seemed to have no effect. Atmospheric discharges occasionally registered themselves on the receiving apparatus, but produced no effect sufficiently injurious to interfere with communication. The electric lighting circuits in Chamiounix violently affected the distant station, and it was found impossible to use the system while the lights were burning. The illuminating system of that town is fed from a three-phase network with 2,500 volts on the primary.

ELECTRIC LIGHT FLASHES.

The Beacon Light Company, of Chester, Pa., is making large improvements in its appliances and system.

The Malden, Mass., Electric Company, of which John S. Bartlett, J. N. Smith and E. W. Rice, Jr., were organizers in 1888, has been sold to New York capitalists. The company has always paid dividends, paying eight per cent up to 1895 and since that date six per cent on its capital of $175,000 stock, $100,000 bonds and $135,000 coupons and notes.

The plan of installing an electric light and power plant in the Connecticut state capitol is not likely to commend itself to the people, who would have to pay for it and for running it, nor is it likely to be approved by the state officers. It is said that the local electric light company will light the building for much less than the cost of operating an isolated plant.

Lewiston, Idaho, after being in darkness about five weeks, will now have light, the light committee of the City Council having agreed with the light company on terms, whereby the city agrees to take 15 arc lights at $10 per light, or if a fewer number be required, the city agrees to take enough incandescents at $2 apiece to make up $150 per month for street lighting.

A permanent organization of the Philadelphia Electric Company, which with an insignificant exception controls all of the electric lighting stations in the city of Philadelphia, has been effected. The new officers are as follows: President, J. B. McCall; vice-president, Wm. F. Harrity; treasurer, Wm. P. Conover, Jr.; secretary, A. V. R. Coe. The directors, as already announced, are: W. L. Elkins, P. A. B. Widener, Thomas Dolan, Jeremiah J. Sullivan, John M. Mack, Allen B. Rorke, Wm. F. Harrity, A. V. R. Coe and J. B. McCall. A. J. DeCamp is general manager of this company and J. H. Vail chief engineer.

THE ELECTRIC PLANTS OF THE BATTLE-SHIPS KEARSARGE AND KENTUCKY.*

BY NAVAL CONSTRUCTOR J. J. WOODWARD, U. S. N.

(Concluded from page 358.)

There are two forward boat cranes having a capacity of 18,000 pounds at a speed of 25 feet per minute. Each crane has the form of a large boat davit, and is built of structural steel, having a box section.

The lower end has a pivot steady bearing on the protective deck, the weight of the crane and its load being taken by a roller thrust bearing on the main deck, and its alignment being preserved by two steady bearings, one on the upper deck and the other on top of the hammock berthing.

Just above the hammock berthing the crane carries a circular platform on which is mounted all the operating machinery, the motive power being furnished by a 50-horse-power electric motor. The pinion of the motor meshes with a large gear on one end of a horizontal cross-shaft, carried by bearings mounted on the platform; the other end of this shaft carries a worm, working a worm-wheel on the upper end of a vertical shaft passing down through the platform, and carrying, at its lower end, a pinion meshing in a circular rack, having its centre in the centre line of the crane, and held by the frame of the steady bearing on top of the hammock berthing. This arrangement allows the motor to rotate the crane.

There is a second horizontal cross-shaft on the platform at right angles to the one that rotates the crane, and geared to it by a pair of mitre gears near the motor end. This shaft carries a worm working a wheel on the hoisting drum, which is supported by pedestals mounted on the platform.

Each of these horizontal cross-shafts, the one for rotating the crane and the one working the hoisting drum, is divided by a friction clutch near the worm end. The disk of the friction clutch on the shaft that rotates the crane forms the pulley for a friction band brake used for braking the crane when rotating. The hoisting drum is provided with a brake consisting of a tapered wrought-iron band wrapped around a flat portion of the drum, the large end of the band being fastened to the platform and the small end being pulled taut by a weighted lever. The band is wound around the drum in the direction the drum turns when lowering; this effectually locks the drum against lowering as long as the band is pulled taut by the weighted lever, but allows it to turn in the hoisting direction with only a small amount of friction. When it is desired to lower, the band must be slackened by raising the weighted lever, which is accomplished by means of a hand-lever.

The two friction clutches and the friction hand-brake for rotating are all operated by hand-levers, which together with the hand-lever for releasing the hoisting brake are all located side by side near the controller for the motor, so that the person operating the crane can easily reach them all.

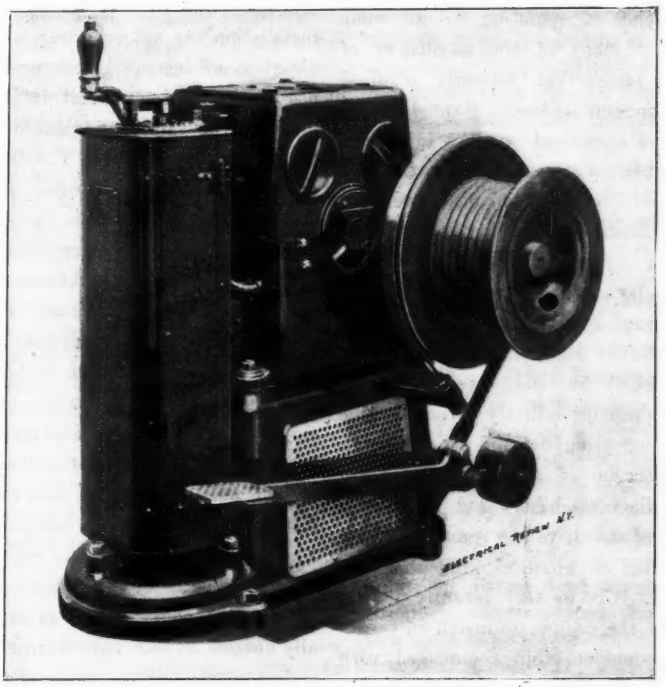


FIG. 3.—HIGH-SPEED DRUM ELECTRIC WINCH FOR SUPERSTRUCTURE DECK OF BATTLE-SHIPS KENTUCKY AND KEARSARGE.

The hoisting tackle consists of a single sheave with a hook for carrying the load. The hoisting cable, made of steel and extra flexible, passes from the drum along the back and over the end of the crane on guide pulleys, through the hook sheave, and is made fast to the head of the crane.

The following description of the motor is given in detail, and may be taken to represent the mechanical features of construction used on all the other motors on these ships, except the fan motors, which being in protected positions are built of the open type. The motors are of the armored type. They have four poles, are shunt-wound (with 80 volts on fields, 160 volts on the armature) and give an output of 50 horse-power, with an armature speed of 400 revolutions per minute. The frame is an octagonal steel casting made in two pieces; feet are cast on the lower frame and are drilled for bolting the motor to its foundation. The upper frame is held in position by six steel tap bolts. The pole-pieces are of cast-steel and are bolted to seats bored in magnet frame and located at 45 degrees from the horizontal. The armature bearings are cast on the lower frame and are fitted with removable caps and split linings. They also have large pockets for catching the waste grease. The caps are held in position by steel bolts and have large grease boxes cast on, fitted with bronze covers held in place by copper-plated steel springs.

The armature bearing linings are cast-iron, babbitted, made in two halves, the upper halves being supplied with slots for admitting the grease lubricant to the shaft. The brush rigging consists of a revolving cast-iron yoke made in two halves fitting on commutator end bearing. This yoke supports four insolated brass studs which are cross-connected by flexible cable, rubber insolated and braided. Each stud has six brush holders with carbon brushes. The carbon is taken from each brush to the brush holder by a small flexible cable or "pig-tail." There are four field coils fitting around and held in position by the pole-pieces. The coils are covered with varnished cambric and taped, then coated with japan. Each end of the winding is soldered to a copper terminal, or binding-post for holding the field leads. The field leads are made of flexible cables, rubber insulated and braided to ½-inch diameter. The field leads are brought through holes in the frame insulated with soft rubber bushings.

The armature is of the drum-wound type, multiple connected. The core is made up of sheet-iron laminations, supplied with slots for carrying the armature conductors and supported by a cast-iron spider, which is keyed to the shaft. The core and slots are thoroughly insulated with paper and mica. The commutator segements are insulated with mica.

The fields of the motor are always excited while the crane is in use, and, if they become open, this electrical control in lowering is lost.

There are eight rheostats at the base of the crane. Each rheostat consists of six panels, filled with ribbon resistance of desired capacity. The panels have terminals at each end for connection of leads, and also flat plates which connect the panels together. These rheostats are connected in two sets of four in series, the sets being connected in multiple, each lead from the controller branching to both sets of rheostats. The circuit-breaker is protected by an iron box, located on the crane, just above the outlet for the wires, and is in the armature circuit only. It never opens the field circuit, because, were such the case, control of the motor in lowering would be lost.

There are two after boat cranes, having a capacity of 4,000 pounds at 40 feet per minute.

Each crane has the same height and reach as the forward cranes, but is built lighter; all of the mechanical operating machinery is of the same design but smaller, so that the description previously given for the forward crane applies equally well to the after crane, except in case of the motor and some of the electrical apparatus.

One 20-horse-power, 160-volt motor is located under the central girder of the turret for the operation of each of the 13-inch ammunition hoists, being supported by the bottom plate of the turret. A drum on the intermediate shaft operates the ammunition car by a flexible steel rope, passing over leading sheaves. The motors

(Continued on page 363.)

* Abstract of a paper read before the Society of Naval Architects and Marine Engineers, New York, November 16, 1899. (See also article on the electrical equipment of the Kearsarge in the ELECTRICAL REVIEW for September 27, 1899.)

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue. NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week, although it is occasionally possible to get in matter received on Monday.

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ELECTRICAL TRANSMISSION OF POWER ON SHIPBOARD.

The article by Naval Constructor J. J. Woodward on the electric power plants of the United States battleships Kearsarge and Kentucky, which is concluded in this issue of the ELECTRICAL REVIEW, contains not only a great deal of information but embodies much suggestion for the thoughtful electrical engineer as well as for the ship builder and naval officer. With the appearance of power plants aboard ship for driving the ship through the water, there was seen at once the convenience of operating by the same power many of the auxiliaries of the vessel that formerly required much and arduous manual labor. These comprised winches for handling cargo, ammunition (in the case of naval vessels) and other weights; windlasses for pulling up anchors from their holding ground on the sea bottom; boat hoists and the mechanism of the rudder and pumps. With the increasing size of ships, especially in the case of vessels equipped for military purposes, came an increasing demand for thorough ventilation of all parts, and again auxiliary machinery had to be employed to drive the ventilating apparatus of whatever kind that was used. Up to very recently it has been the custom to install on vessels a system of piping connected with the main boilers and at the various points of application of power to locate small engines to operate the individual auxiliaries. While it was known that these machines were necessarily wasteful of steam, often to an almost incredible degree, and that the piping itself, through losses of condensation, was inefficient, little was really known of the very great losses entailed by the use of steam power auxiliaries. Tests made aboard the U. S. S. Minneapolis, some two years ago, showed that these losses amounted to a very substantial percentage of the total amount of steam generated in the main boilers and were enough to curtail seriously the effective cruising radius of such a ship and to make the expense of her operation far greater than it apparently should be. The solution of the difficulty lay, as was at once seen, in the adoption of electrical transmission for her auxiliaries, and it is upon the fine ships described by Constructor Woodward that the experiment has first been tried in a thorough way.

The amount of power consumed by these auxiliaries is sufficient to warrant the use of engines of a fairly economical type for the generation of the auxiliary power, while the losses in transmission and conversion are, as everyone knows, practically insignificant. The effect of the electrical installation has not been only in the direction of increased economy, but has also comprised a vast improvement in the safety and comfort of the ship and its people. The danger of bursting steam pipes, especially in action, is enhanced by the fact that the large openings necessary for them in passing through bulkheads and partitions, render it practically impossible to guard thoroughly against accident, especially that due to hostile shot, and prevent the destruction of the ship by sinking. In the air-tight and crowded compartments of a modern ship of war, not even the most elaborate system of ventilation has enabled the temperature due to the presence of the pipes to be kept down to a comfortable point; this was especially notable in our navy during the trying months of the Summer campaign, in the tropical waters around Cuba. Further than this, the exquisite control and perfect adaptability of the electrical mechanism are vital advantages over anything claimed for the old-fashioned steam system. The tests of the Kearsarge plant may be said to be complete and highly satisfactory, and it is hoped that the adoption of this modern and satisfactory method of auxiliary power supply upon the vessels now building for the United States Navy, will be hastened by the great success that has attended these trial installations.

LONG-DISTANCE TELEPHONY.

The problems presented by long-distance telephony are two-fold; first, the transmission of sufficient energy to the end of the line to work a receiver audibly, and second, the preservation of the complex wave form of the telephone current during its passage along the conductor. The interesting lecture by Professor Pupin, reported briefly on another page, has given some faint suggestion as to how the latter and far more difficult problem may be attacked. The problem of sufficient energy is comparatively simple, because, while it is not easy to increase greatly the power of transmitters, the telephone receiver is such an excessively sensitive instrument that only the smallest trace of energy is necessary to make it give good results. The other problem, the preservation of the wave form in its struggle with the various elements of the circuit which tend, in the first place, to reduce it to a simple harmonic vibration, and, in the second place, to damp it out altogether, is entirely different and far more difficult. It is curious that the suggestion which seems to flow from Professor Pupin's remarks and the brilliant analytical labors of Mr. Heaviside is to increase both the inductance and capacitance of the line while diminishing, as far as possible, its resistance. This applies equally to submarine cables, and, now that very long cables are under consideration (of which, if no radical innovation is made, the speed of working will be very slow) the whole subject deserves the most careful and serious study on the part of electrical engineers.

During the Spanish-American war, the ELECTRICAL REVIEW said a great deal about the valuable aid rendered to the United States war vessels by the electric searchlight. It was then demonstrated, and official reports have since acknowledged, that the searchlight is among the most necessary and valuable apparatus for military service. It now appears that the British army in South Africa has recognized this fact. A recent dispatch to the British War Office states that General Lord Methuen, who is at the bridge on the Modder River, is in communication with the besieged town of Kimberley, about 20 miles away. It is the rainy season in that country, and the overhanging clouds are probably used as a background on which wig-wag messages are reflected by means of the searchlight beam.

Long Electrical Waves.

Under the auspices of the New York Academy of Sciences (Section of Astronomy and Physics), Professor M. I. Pupin gave a lecture, illustrated with experiments, on the subject of long electrical waves, in a lecture room of the Engineering Building of Columbia University, New York city, on the evening of December 4.

Professor Pupin began his remarks with a statement of the importance of the study of wave propagation in conductors from the points of view both of the physicist and the technician. He pointed out the great beauty and interest of the mathematical theory of such wave motion, and also showed how the knowledge of the method of wave motion in wires was of the most vital importance to the art of telephony, and possibly to that of long-distance transmission of power by alternating currents.

"According to Dr. Hallock," said the lecturer, "the vibrations concerned in the transmission of speech telephonically range from 150 to 1,500 per second, the latter number being a tenth harmonic of the fundamental tone of ordinary speech. In a telephone line, as long as that from New York to Chicago, there are, consequently, from five to seven wave-lengths of this higher vibration period included in the length of the circuit. This consideration alone shows the importance of the study of the subject to telephone engineers."

The lecturer proceeded then to give a review of the remarkable labors of Maxwell, Kelvin, and especially of Heaviside on this subject, laying particular stress upon the importance and beauty of the contributions made by the latter savant to the theory of this subject. He said that the two most important considerations concerned in the study of such wave propagation were wave length and attenuation, or the dying out of waves through the effects of resistance in the circuit. The velocity of transmission which, of course, determines the wave length, is dependent upon the three constants of the circuit—resistance, capacity and self-induction. Given these features of a circuit an attenuation constant may be calculated such that each wave diminishes in amplitude from its predecessor by a constant amount, the whole effect being that an impressed electrical vibration dies out in a long wire according to a simple logarithmic law.

The vast importance of attenuation is understood when it is recalled that it imposes a definite limit upon the distance over which telephone conversations are possible. This limit is not due to the attenuation of the fundamental vibrations due to the principal tones of speech, but to suppression of the faster harmonics which give quality to the voice and which, being more rapidly damped out by the circuit, may leave at the end of the line sufficient energy in the fundamental to affect a telephone receiver, but still with the wave-form so altered that speech is unrecognizable.

According to the law laid down by Heaviside from purely theoretical considerations, attenuation can be diminished by increasing either the conductance or inductance of the circuit. Now, practical considerations have set a limit to the increase of conductance, while the problem of increasing the distributed induction of a circuit is one of extreme difficulty. While Hertz made many and brilliant experimental researches upon electrical waves of very short wave length, still no experiments have been made to date to verify the law of Heaviside concerning long waves. This, said the lecturer, was the object of his research, and he proposed to show how the equivalent of a long circuit could be brought within the limits of the laboratory and the curious conditions existing in it be studied at ease.

As is well-known, the wave length is inversely proportional to the square root of the product of the capacity and inductance of a circuit under given conditions of frequency. In order to simulate a long telephone circuit, the lecturer showed spools of wire which had been wound with insulation and tinfoil between each layer of wire, the tinfoil pieces being connected together. These coils, which are of small dimensions, each represent ten miles of the ordinary long-distance telephone circuit, containing a resistance of one ohm, a capacity of one microfarad and an inductance of .005 henry per mile. He had constructed twenty such coils, representing 200 miles of circuit, and these were exhibited.

"From theoretical considerations," said Professor Pupin, "it can be seen that there will exist with an impressed alternating current upon such a line, a system of stationary nodes and loops in it, having maxima at its extremities and its middle point and, in general, resembling the superposition of a sine curve upon a catenary." The twenty coils in series upon a table were then connected to a source of alternating current of about 600 cycles per second, and an exploring coil, consisting of a few turns of wire to which was attached a loud-speaking telephone receiver, was passed in succession over each. The great variations in the loudness of the note of the telephone showed distinctly to the audience the existence of these nodes and loops. The object of these experiments, said the lecturer, was not only to prove the vital points in Heaviside's theory, but also to find a way of diminishing attenuation for practical use, and to discover some method of installing lines in order to prevent deformation of waves and loss of energy. For this reason he had made another form of artificial circuit, what he called a second type of "slow-speed conductor," and this consisted of a number of coils in series, between each pair of which was connected one plate of an equal number of small condensers. This apparatus was made up in five pyramidal glass cases, each containing 80 coils and 40 condensers. The coils were so wound that each section of the circuit was equivalent to 2½ ohms resistance .0125 henry inductance and .025 microfarad capacity. Hence, each section represented 2½ miles of telephone wire. From theoretical considerations, the lecturer had concluded that this arrangement, up to frequencies of 3,000 per second, was in all respects analogous to a telephone circuit. At points equidistant along this artificial circuit wires were tapped off and led to a series of plates over which played a contact point, and this was connected to one side of an absolute electrometer. With this arrangement in circuit with the alternating generator before mentioned the existance of the nodes and loops mentioned above was made plainly evident, and also the existence of a secondary series due to the presence of a third harmonic in the current from the alternator. This method of constructing a circuit, said the lecturer, appeared clumsy and cumbersome, yet it was a step toward a method of building telephone circuits for long-distance work, which would not possess the disadvantages of those at present in use and the description of which we would reserve for a later communication.

The municipality of Mistretta, Italy, invites tenders, not later than December 31 next, for the establishment of a service of electric lighting in that town.

What Substances Fluoresce?

To the Editor of Electrical Review:

Will I be troubling you too much by asking you to let me know where I can find the latest list of substances which are fluorescent to the X-rays. I have looked in the libraries here, and can not find the names of all of the substances which fluoresce when exposed to the X-rays. As I understand, it has been said there are seventy-two substances which are fluorescent to the X-rays.

A. L. Hodgdon.

Baltimore, November 27.

The "Capsule" Battery Wanted.

To the Editor of Electrical Review:

A friend of mine in London writes to know if I can get any information for him of a battery called the "Capsule," a cut of which I enclose. I would esteem it a great favor if you could put me in communication with the manufacturers of this article. He says he understands there is quite a trade in this battery on this side, but I can not get any trace of it here.

F. W. C.

Chicago, November 20.

The Electrical Trades Society of New York.

To the Editor of Electrical Review:

By mistake, notice was sent out stating that the annual meeting would take place at the Astor House, on Monday, December 4, 1899. According to our "Articles of Incorporation," taken out last year, it was provided that our annual meeting should take place on the second Tuesday in December, beginning 1899; therefore, the annual meeting this year will be held at the Astor House (Room 74), on Tuesday, December 12, at 2 P. M., instead of on Monday, December 4, as per previous notice.

A. P. Eckert, Secretary.

New York, November 29.

PERSONAL.

Rev. and Mrs. John R. Cushing have announced the marriage of their daughter, Bertha May, to Mr. Charles Tripler Child, technical editor of the Electrical Review, at Malden, Mass., on November 30, 1899.

Among recent foreign arrivals in New York city are Managing Director Monks, Mr. H. F. Parshall and Mr. W. E. Baylor, of the British Thomson-Houston Company, London; Mr. A. K. Baylor, London; Mr. R. W. Blackwell and Mr. H. Lomas, of R. W. Blackwell & Company, Ltd., London. These gentlemen are visiting the United States to look into the state of the American electrical trade, especially with reference to export orders.

THE ELECTRIC PLANTS OF THE BATTLE-SHIPS KEARSARGE AND KENTUCKY.

(Continued from page 359.)

are of the armored type. They have four poles, are shunt-wound with fields excited at 80 volts, and give an output of 20 horse-power at 160 volts, with an armature speed of 350 revolutions per minute.

The solenoid brake consists of a cast-iron bracket bolted to the under side of the turret, supporting a pair of solenoid magnets, which when in action lift a pair of movable cores that are attached to one end of the brake lever. The fulcrum bracket that supports the brake lever is also bolted to the turret. To one end of the brake band is attached a gun-metal fork casting for fastening the brake band to the brake lever, while to the other end is attached a gun-metal strap bolt working in a forked casting which is also attached to the brake lever. This works as a turn-buckle, and allows for adjustment of the brake band.

When the current is cut off the magnets are deenergized, and allow the movable cores to fall, tightening the brake band on the brake wheel, and preventing the armature from turning.

One 6-horse power, 160-volt motor is located outboard of each 8-inch gun, on the gun floor under the sighting hoods, for the operation of the 8-inch ammunition hoist. A shaft extending across the turret from one motor to the other is divided into four sections, the two outboard ones being carried by bearings cast on the motor frames and forming intermediate shafts for the motors, the two middle ones being carried by bearings formed in the deck lugs of the 8-inch guns. The two outboard or end sections are coupled to the middle sections by means of cylindrical shaft couplers, which are keyed to the end sections and fastened to the middle sections by set screws. The two middle sections are both keyed in a cylindrical shaft coupler at the centre, thus acting as one shaft.

Each end section carries at its inboard end a gear meshing with a pinion at the armature shaft; and at its outboard end a drum which operates the ammunition car by a flexible steel rope passing over leading sheaves.

The drum is attached to the shaft by a clutch operated by a hand lever, so that it may either run loose or turn with the shaft, as desired. It also has a band brake operated by a hand lever.

For ordinary operation the end sections of the cross-shaft will be disconnected from the central portion by means of the set screws in the shaft-couplings, so that each motor operates its hoist independently, and the load is hoisted and lowered by starting and reversing the motor by means of the controller, the drum being held tight on the shaft by its clutch, and the band brake not used. If, however, one of the motors should be made inoperative, both hoists can still be worked by connecting in the central portion of the cross-shaft by means of the set screws in the shaft couplers at its ends, thus making the cross-shaft act as one solid piece and allowing both drums to be operated by the uninjured motor.

There are two 6-pounder winch ammunition hoists located at frame 74, just aft of the after barbette on the berth deck, starboard and port. Each hoist consists of a cast-iron bed plate, on top of which is bolted an armored motor, and underneath the motor is located the resistance box. The bottom of the bed-plate is extended, and the operating controller bolted to this extension. The shaft for the drum is supported on brackets or bearings, which are part of the motor casing. Motion is communicated from the armature of the motor to the drum shaft by means of a cut cast-steel pinion, having 14 teeth, meshing into a cut cast-steel gear, having 66 teeth, and secured in an oil-tight covering. On one end of this shaft is keyed the drum, which is 12 inches in diameter and has a 7-inch face. On the inner end of this drum is cast a brake flange. The brake consists of a steel band, to which is bolted vulcanite fibre; one end of the brake band is secured by means of an adjustable bolt to the bed-plate of the hoist, and the other end is secured by a bolt to the operating lever, and an adjustable weight is provided at the outer end of this foot lever.

The winch can hoist 120 pounds at the maximum rate of 250 feet per minute.

There are ten endless-chain ammunition hoists. Each hoist consists of a pair of endless chains, traveling over sprocket wheels, and reaching from the point of loading to that of delivery. These chains support between them carriages placed at proper intervals for receiving the ammunition, the whole being driven by an electric motor through a system of gearing. The intermediate shaft of the motor is geared to a counter shaft of the hoist, which has a pinion on the other end engaging a gear on a shaft carrying two sprocket wheels. Two endless chains pass over these sprockets and run up to two similar sprockets in a casting set in the deck at the point of delivery. These endless chains are connected at equal intervals by carriages on which the ammunition boxes are placed. The two bearings of the shaft for the lower sprockets can be moved through an arc of a circle having its centre at the centre of the counter shaft which is geared to the sprocket shaft. This permits the distance between the upper and lower sprockets to be adjusted to compensate for stretch and wear of the chain. The adjustment is made by means of two adjusting screws, with lock nuts, which push the bearings down. When the adjustment is made the bearings are held in place by a set screw.

In order to prevent the load from overhauling and running the hoist backwards in case the driving mechanism should fail, pawls are provided which allow the carriages to pass up, but will catch and hold them if they move down. When it is desired to lower ammunition, these pawls must be thrown out of action by means of a lever at the side of the hoist. This lever moves a sliding rod which raises the pawls and turns them back into pockets, so that the carriages can descend without engaging them. When the lever-handle is up the pawls are in action, and when it is down they are out of action. This lever carries a pawl switch, described later in the motor description.

A hand gear is provided, in order that the hoist may still be operated, if, for any cause, the driving motor fails. It consists of two hand-cranks, located at convenient places in the magazine or ammunition passage near the hoist, and connected by an arrangement of shafts and bevel gears to a clutch on the end of the motor intermediate shaft opposite the hoist. This clutch is operated by a hand-lever, moving in the plane of the shaft, and is so constructed that when the lever is moved towards the motor, the intermediate shaft is connected to the large motor gear and the hoist is electrically driven; but when the lever is moved away from the motor, the intermediate shaft is disconnected from the motor gear and is connected to the gearing of the hand gear, and the hoist is ready for hand drive. When the lever is thrown for hand drive, the intermediate shaft runs freely in the motor gear, and when it is thrown for electric drive, the shaft runs freely in the last bevel gear of the hand-drive system.

One 5-horse-power, 80-volt, series-wound motor is located outboard of each rammer on the 13-inch gun floor. The shaft couples direct to the rammer, in the mechanism of which is a friction sheave, which may be adjusted so that in case too great obstruction is met, as would occur if the rammer reached its limit before the motor is stopped, this will slip and prevent so great a load as to cause the fuses, or circuit-breaker, to act.

The motors are of the armored type. They have four poles, are series-wound, and give an output of 5-horse-power at 80 volts, with an armature speed of 775 revolutions per minute.

One 2½-horse-power, 80-volt, series-wound motor, located in the central girder below the 13-inch gun floor, elevates each 13-inch gun. It stands with the commutator toward the centre line of the turret and drives through a pinion and train of gears. There is an idler gear inserted in the mechanism of the right gun, in order that the two motors may not be exactly opposite each other and thus render access to the brushes difficult. It is operated by a controller situated beneath the telescope under the sighting hood. The rheostat is located below the controller, and the switch panel is fastened to the mantlet plate at a convenient point. The motors are the same as those used for the 13-inch rammer, except that the field and armature have different windings so as to give a speed of 300 revolutions per minute at 80 volts and 2½-horse-power output. The controlling devices are generally similar in principle to those used with the rammers for the 13-inch guns.

There are ten 50-inch ventilating blowers, each driven by an electric motor. Each blower is direct-connected to a 12-horse-power electric motor, supported on a shelf projecting from the side of the blower. They are set in pairs, equally distributed between starboard and port. The motors are entirely open, shunt-wound, of the multipolar type, having an output, with 160 volts on the armature, of 12 horse-power, with an armature speed of 500 revolutions per minute. With field regulation the speed can be reduced to 400 revolutions, and by running the armature on 80 volts about one-half the above speeds can be obtained.

The superstructure winches consist of a cast-iron bed-plate, with projections or lugs cast thereon to receive the foundation or holding-down bolts. Secured to this bed-plate, one on either side, are two cast-iron stands or bearings; back of and between these stands and secured to the bed-plate is an armored motor. This motor is geared by means of cut cast-steel pinion and gear to an intermediate shaft, which runs through bearings which are part of the motor case, and whose outer ends are supported by bearings in the stands already mentioned. On the right-hand side of the shaft, which is called the "intermediate shaft," is secured a semi-steel pinion, with flanges each side, extending up to the pitch line. This driving pinion meshes into a spur-wheel made of semi-steel, and flanged each side up to the pitch line. This spur-wheel is securely keyed to the main or drum shaft, which is also supported by journals in the stands above mentioned. On the inner face of this spur-wheel is bolte l hard maple-wood blocks, five in number, forming a circle. The section of these blocks is that of a frustum of a cone with a flat face. These woods are known as "friction woods."

Running loose on the main or drum shaft is a drum made of cast-iron, known as the "friction drum." This drum is 20 inches diameter in the body, 21½ inches long on the face, and the friction flange, which is the end which abuts against the friction woods, is 29 inches diameter. This "friction flange" is grooved to correspond to the maple-wood blocks. To the outer end of this drum is cast a brake flange. This drum is loose on the shaft, and to hoist, or to wind up the rope, the drum is forced laterally, sliding on the shaft, so that the groove in the friction flange of the drum and the maple-wood blocks come in close contact.

This forcing or moving the drum along the shaft is accomplished by means of a cam, one part of which is stationary, the other being movable, and connected by suitable levers and connections to the upper right-hand lever. This cam is located between two series of ball bearings, one on either side; each ball bearing consists of two hardened steel disks, with a "V" shaped groove turned in the adjacent faces of each, in which roll ½-inch-diameter steel balls. The two disks are secured together by a cast-iron casing or ring, so arranged that it is fastened to only one side of the disks, its purpose being to allow of handling the assembled ball bearing without danger of the balls falling out, and at the same time to exclude dirt and foreign substances. Between the outer bearing and the ball bearing is a split and threaded collar whose function is to take up the space obtained by the gradual wearing away of the friction woods. On the outside end of the main or drum shaft is securely keyed a winch head 18 inches diameter, 15 inches face, and with 24-inch diameter flanges.

The main-deck winches consist of a cast-iron bed-plate, to which is secured, one on either side, two cast-iron stands, or bearings; at the back end of this bed-plate, and secured to it, is an armored motor, and through

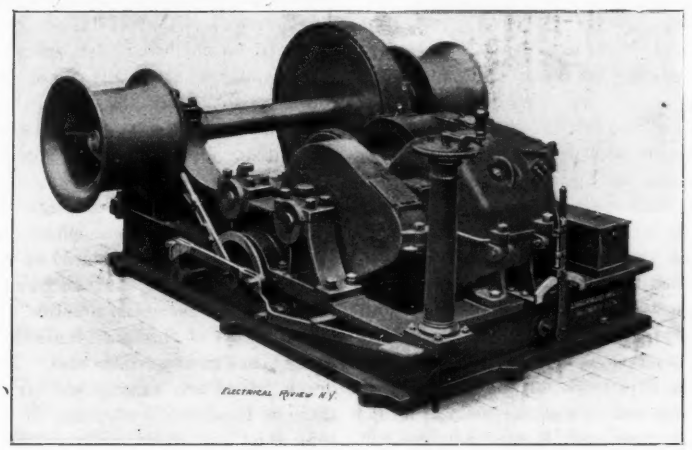


FIG. 4.—COMPOUND-GEARED ELECTRIC WINCH FOR MAIN DECK, BATTLE-SHIPS KENTUCKY AND KEARSARGE.

suitably cut gear is connected with the intermediate shaft, which runs through bearings or journals which are part of the motor, and the outer ends of which are supported in bearings or stands above mentioned. On the right-hand side of this intermediate shaft is keyed a cut-steel gear, having 49 teeth, which meshes into another cut-steel gear having 49 teeth; this second gear is securely keyed to a second intermediate shaft. The function of these two gears is simply to communicate motion from the first intermediate shaft to the second intermediate shaft. On the second intermediate shaft, each end of which is supported by bearings in the stand above mentioned, is keyed securely a cut-steel pinion, having 15 teeth, and a semi-steel cast pinion, having 29 teeth, flanged to the pitch diameter. Also, on this second intermediate shaft, running loose, is a cut-steel pinion, having 36 teeth, and driven by a clutch, as will be explained. Below, and slightly to the rear of this second intermediate shaft, is an eccentric shaft, running in babbitted bearings. On this shaft is securely keyed a 36-tooth cut-steel gear which meshes into the 15-tooth cut-steel gear above mentioned. Also, on this same shaft, and secured to it, is a 15-tooth cut-steel gear which runs loose on the second intermediate shaft, as above described. The purpose of this eccentric shaft and its accompanying gears and pinions is to give a back gearing to the machine. The 29-tooth semi-steel pinion above mentioned meshes into a 61-tooth semi-steel gear, flanged to the pitch diameter, which is securely keyed to the main or winch shaft, which is supported by bearings in the stands above mentioned. On either end of this main or winch shaft is securely keyed a winch head, 18 inches in diameter, 15-inch face and 24-inch diameter flange.

The motor running at its full speed, and with back gears not thrown in, produces a rope speed of 300 feet per minute at the winch head, and with the back gears thrown in, produces a rope speed of 50 feet per minute; the back gearing thus being 6 to 1.

On the second intermediate shaft is secured a flanged wheel, provided with a band brake, which consists of a wrought-iron band, to which is bolted maple blocks, one end of which is secured to the bed-plate, and the other end provided with a turnbuckle for adjustment, which in turn is secured to a lever, and this lever, through connections, to a foot lever.

On the eccentric shaft is a composition collar, made in two parts, which actuates a dog, known as the safety dog. Whenever the back gear is thrown in this dog is forced between the solid part and the movable part of the clutch on the second intermediate shaft, thus automatically preventing, through accident or design, the clutch being thrown when back gear is in. When the eccentric shaft is moved back so that the gears are not in mesh, then the clutch is free to act, and is put in contact. The eccentric shaft is operated by a hand-lever, fitted with a detent catch, which travels in a notched quadrant. This lever is located on the right-hand side of the machine for a right-hand winch, and on the left-hand side for a left-hand winch. The clutch is operated by means of a lever on the end of the shaft, extending at right angles to the intermediate shaft, and provided at its outer end, directly back of the motor, with a similar lever to that supplied for the eccentric shaft.

Back of the motor, located on the right-hand side for the right-hand hoist, and on the left-hand side for the left-hand hoist, and attached to the bed-plate, is a cast-iron column, with a brass top-plate. The function of this column is to support or guide the steel shaft extending below deck to the controller. The lever, which is fitted to the upper end of this shaft, is provided with a catch, operated by pressing a button on top of the wooden handle. The brass top-plate is provided with a series of marks which correspond to corresponding points of cutout in the controller.

In concluding this description of the electric plants of the Kearsarge and the Kentucky, I wish to express my appreciation of the efforts made by the engineers charged with the design and construction of these various machines, to meet, in the best possible manner, the requirements of installation on board ship, so as to obtain that mechanical robustness of parts and freedom from the effects of corrosion, due to salt-water, necessary to insure durability in service. I believe the question of the satisfactory working of the electric drive for auxiliary machinery on board ship at the present time, to depend largely upon the adoption of satisfactory designs for the minor details of the machines.

I wish, finally, to acknowledge my great obligations to Mr. Maxwell Day and Mr. E. F. Dutton, of the General Electric Company, and Mr. H. N. Covell, of the Lidgerwood Manufacturing Company, for information and descriptions received as to machines furnished by those companies and which have been embodied in this paper.

Chicago Electrical Association.

The next meeting of the Chicago Electrical Association will occur on Friday evening, December 15, when Mr. E. S. Halsey will read a paper on "Electric Meters."

The New Cable-Ship Von Podbielski.*

The cable-ship von Podbielski was recently launched at Messrs. David J. Dunlop & Company's shipbuilding yard, Port Glasgow. The event is of interest, chiefly owing to the fact that this cable steamer is the first vessel of this class owned by Germany. She was built for the Norddeutsche Seekabelwerke Aktiengesellschaft, of Cologne, and bears the name of the present chief of the German postal and telegraph administration.

The ship has been built more with a view to meet the requirements of a modern cable-repairing steamer than of a cable-laying steamer, and with a good speed, twin screws, a light draught, and the latest designed cable machinery, she should in every way prove satisfactory. From a shipbuilding point of view, the von Podbielski is built to meet all the requirements of the highest class of the Germanscher Lloyd. The following are her chief measurements: Length between perpendiculars, 255 feet; breadth (moulded), 35 feet; draught (loaded), 16 feet 6 inches. Her two sets of engines will give her a speed of 13 knots when loaded, and the builders believe that she will be the fastest cable steamer afloat.

Messrs. Johnson & Phillips are sub-contractors to Messrs. Dunlop & Company for the cable machinery, which is of the most modern description, with several improvements in detail. Of greatest interest is the double combined picking-up and paying-out machine forward. It is fitted on the main deck, just aft of the foremast, the drums standing through hatches in the spar deck. The starting levers and stop-valves for the engines, as well as the brake-screws, are situated near together, conveniently for working on the spar deck. The machines are built on three steel frames, and are being arranged side by side, the paying-out machine to port and the picking-up machine to starboard. They are driven by two high-pressure twin engines, with 8-inch cylinders and 8-inch stroke, developing 110 horse-power at 300 revolutions per minute, with steam at 150 lbs. per square inch. Either engine can drive either machine (or both machines if required, so that one drum could be paying out while the other is picking up), and for an exceptionally heavy load both engines can be coupled on to one drum. The crank-shafts of the engines are parallel with the centre line of the ship, and are geared by double helical bevel gear to the first motion shaft, the engine pinions being of phosphor bronze and the remaining wheels all of cast-steel. In order to put one engine out of gear, the bevel wheel is drawn along its shaft by means of a large screw-nut, concentric with the shaft and working on a screwed shoulder. A "tommy bar" is employed for this purpose. The nut serves to take the thrust when the machine is working. Each machine is arranged for two speeds and powers—the picking-up machine either for 25 tons lift at one knot per hour, or 10 tons lift at 2½ knots, and the paying-out machine for 10 tons lift at 2½ knots, or 6¼ tons at four knots.

Each of the main cable drums, its gearing and brake drum, is combined by gearing the main drum internally and employing the outside of the guide ring as brake drum. Thus, when it is desired to pay out without the engine, this combination drum is the only part of the machine running (except, of course, the holding-back sheave), and the speed is controlled by the brake. The drums run loose on a shaft common to both machines, which is fixed to the frames and serves as a good tie for them. Fine adjustment of the brake screws is obtained by working them by means of a worm gear. Messrs. Johnson and Phillips have made an improvement in these brakes by fitting them with an adjustable lock-nut. After the brake has been regulated to any desired tension, the nut is screwed up into position, and then the brake can be released and reapplied as often as necessary without it being possible to increase the tension beyond the amount to which it was originally adjusted. The brake blocks are all attached to steel brake straps, and the cooling water is led round each brake band by a pipe fitted with nozzles at intervals, so that the water is distributed all round the face of the drum during working. A small Worthington steam pump is employed for pumping the water. The brake drums are suspended on springs, in order that the bands may leave the drums equally all round when released, and these springs are, of course, adjustable to allow for the wear of the blocks.

A steel driving chain, from the intermediate shaft of the machine, actuates the hauling-off gear. This chain is connected to the shaft by means of a ratchet gear which drives it for hauling off when picking up, but when paying out allows it to run free, thus making the arrangement automatic and saving a clutch. The main frames are of wrought steel, and the first and second machine shafts are carried in a self-contained steel frame to which the engine bed-plates and the main frames are attached. This makes a very rigid arrangement. It may be added that the cable drums are 5 feet 6½ inches diameter on the tread, and 1 foot 7 inches wide between the flanges; the brake rings are 6 feet 5¼ inches diameter and 10½ inches wide; and the whole machine weighs 31 tons.

The paying-out machine for long lengths of cable is fixed aft. It is placed on the spar deck near the stern of the vessel, and a working platform is provided above the machine frames. The various levers are arranged conveniently for operating from this platform, and the attendant there can watch the cable as it leaves the ship. This machine is single, with only one cable drum and one double-cylinder engine, erected on heavy cast-iron frames. The drum overhangs the frames, and a large gear wheel and two brake pulleys are placed on the same shaft between the two frames. According to the usual practice, the brake pulleys of this machine run in water tanks to keep them cool. The brake bands are exactly similar to those of the forward machine, except that they are fitted with weighted levers, which is also according to usual practice. A modification has been made in these, however, which may be considered an improvement. Instead of the weights always occupying the same position on the lever, and the only adjustment of brake-power being by adding or deducting weights (often requiring a second hand), the weights can be moved along the levers to a certain extent by means of a hand-wheel and screw. In this way the tension of the cable may be varied through a considerable range without the necessity of adding or removing the weights. By means of another hand-wheel and worm gear the brakes can be released bodily, and they can be adjusted to act simultaneously or one after the other. The rod at the end of each brake lever ends in a dashpot to steady the movement and prevent violent oscillations of the levers. The holding-back gear for this machine has double jockey sheaves, with brake wheels attached. These run in a water tank made of cast-iron, which also serves as the frame gear. The shaft of one of the sheaves is connected to the pinion shaft of the machine by means of a steel pitch chain, wheels and clutch, so that it will form a hauling-off gear if it is required to haul the cable back again for any purpose. The cable drum is 5 feet 8½ inches in diameter on the tread, and 13 inches wide between the flanges. The brake pulleys are 4 feet 6 inches in diameter and 12 inches wide. The total weight of the machine is 15½ tons. The driving engine has the same sized cylinders and the same stroke as the forward machine, but a reducing valve is also provided, so that it only receives steam at a pressure of 90 pounds per square inch (as also do the ship's winches, etc.), and develops 60 British horse-power at 200 revolutions per minute.

The bow sheaves are arranged in accordance with the practice which, we believe, originated with Messrs. Johnson and Phillips. The three sheaves run in bearings on girders built into the vessel, and each sheave is provided with cast-iron whiskers or guards to prevent the cable from jumping the sheave. The plating of the stem of the vessel is worked up to meet these whiskers, and thus the contour of the head of the vessel is preserved. At the stern there is only one sheave, the bearings of which are attached to girders built into the ship in the same way.

Two sets of dynamometers and leads are provided forward, one for each cable drum, and there is also one set aft. These appliances are of the firm's latest design, the sheave and its carrier sliding upon a central tubular column. This latter acts also as a dashpot, being partially filled with oil or soapy water, in which work a piston and rod attached to the sheave.

Opening bell mouths are provided on each cable tank to guide the cable. Thence the cable is led to the picking-up and paying-out machine through a series of opening bell mouths carried on small standards about 18 inches above the deck. There are three cable tanks, the first and second being arranged forward, and the third aft. Their capacity is about 20,500 cubic feet.

The testing and speaking instruments are of the most recent design, including two Sullivan galvanometers, high resistances of manganin, Wheatstone bridges, a Siemens-Morse ink-writer, keys of the Tonking and other patterns, and all the necessary accessories and tools. In general there is of necessity little of novelty to record in connection with the instruments, but it may be mentioned that great atten-

* *From the London Electrician.*

tion is being paid to points of detail, such as facility of manipulation, perfect insulation, etc.

One of the most noteworthy features, however, is a 300 volt battery of storage cells in place of the time-honored Leclanché or the more recent dry cell. The type of cell employed has been recently introduced into England by Mr. Sullivan, it being of German construction—the only piece of German apparatus in the whole equipment. It consists of a small glass bottle 3½ inches high by 1¾ inches external diameter, containing the lead and lead peroxide electrodes in the form of square rods about ½-inch side and 1½ inches long, with slightly corrugated surfaces. These rods are formed around lead strips, the upper ends of which project through the seal at the top of the bottle, while the lower ends dip into small porcelain cups resting on the bottom of the bottle which are filled with a special wax composition covering also the bottom of the bottle. The electrodes are thus held firmly in place, and kept at a distance of about ⅜-inch from the bottom. A glass tube passing through the centre of the sealed top enables the gases to escape and provides a means of adding acid. For the sake of rigidity this tube passes to the bottom of the vessel, but there is a hole in the tube near the top to allow for the escape of the gases. The weight of the cell with acid is 7½ oz., and its capacity is about one ampere-hour. A charging current of 0.1 ampere is recommended, and a discharge rate not exceeding 0.2 ampere. The internal resistance of the cell is 0.15 ohm.

The ship is flush decked, is fitted throughout with electric light, has a powerful searchlight and other "latest improvements." She will be principally engaged in the repairing and laying of the German Government cables in the North Sea, Baltic and Channel. The company has a factory in course of construction at Nordenham, near the mouth of the Weser, the technical control of which will be in the hands of Messrs. Felten and Guilleaume, of Mülheim-on-Rhine, who are well-known as manufacturers of copper wire and of cable for electrical and other engineering purposes.

Residents of the boroughs of Brooklyn, Richmond, Queens, New York, and Jersey City, N. J., may now have limited telephone services from their homes for $24 a year. The maximum service under this rate is 300 messages a year. Heretofore, the New York & New Jersey Telephone Company would not put in a telephone for less than $40 a year, with the privilege of 500 messages annually. Four subscribers are put on one line under the new system.

Scientific Lessons of the Anglo-Boer War.

The scientific lessons of the war are crowding upon us, says *Nature*. We have already referred to the blunder made by our military authorities, in not sending Marconi apparatus to South Africa among the first equipments. We now learn, indeed, after the investment of Ladysmith is drawing to a close, that Marconi apparatus is being sent out. The silence of Ladysmith during the last eventful weeks will point the moral, which is not likely to be forgotten in the future; and it may well be that in the movements about to take place, in which the Ladysmith and the relieving force should be able to work in concert, the absence of a sure and rapid method of signaling, the absence of the Marconi apparatus, may render this difficult if not impossible. We have been informed on good authority that some time ago the importance of a locomotive searchlight in operations of war was strongly represented to the military authorities; but they would have none of it. Fortunately, however, the naval force in Natal has now provided the army with one. It is certain to do good service.

There can be little doubt that the presence of another scientific instrument, the balloon at Ladysmith, has saved the situation. A moment's consideration of what this touch of science can do for us will indicate that the above expression is well grounded. Imagine two identical maps of Ladysmith and its surroundings, including the region dominated by our guns, carefully marked with squares, so that the position of any patch can be exactly defined by the rectangular coordinates shown at the side. A1, A20, etc., X6, Z30, Z40, etc. Imagine one of these in the hands of an officer, who knows the ground thoroughly well, in the car of the captive balloon. He telephones the position of the enemy to the officer commanding the artillery down below, who is possessed of an identical map. From this he can at once determine the azimuth and range, and in a few minutes the shell may be fired in the required direction. The telephone of the balloon will inform the gunners how the shell has been dropped, and any directions regarding range can be given. It will therefore be impossible for the rebels, thanks to the balloon, to form in daylight in any large numbers for an attack on the camp, without rendering themselves liable to the searching fire of the guns. May we hope therefore that the balloon will also be used along the chief line of advance? During a calm day it is possible that this scientific instrument may be far more valuable than an army of scouts, though the difficulties attending its working are fully recognized. Seeing then how important scientific instruments are in this struggle, in which millions are freely spent, we return to our question, how is it that there is no scientific committee to advise the government in such matters, even if only to anticipate scientific applications? and how is it that from the grand council of the nation, the privy council, men of science are rigorously excluded?

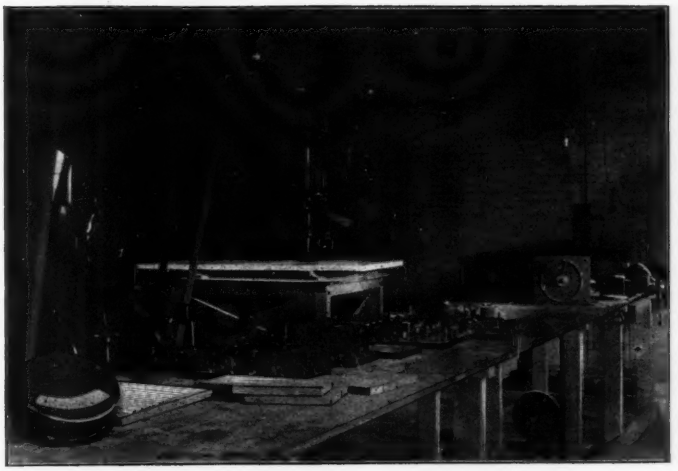


FIG. 1.—A MODEL FACTORY. SWITCHBOARD ASSEMBLING ROOM.

FIG. 2.—A MODEL FACTORY. POLISHING AND DIPPING ROOM.

A Model Factory.

The two illustrations herewith are from photographs in the recently equipped factory of the Falcon Electric Manufacturing Company, 432-434 East Seventy-first street, New York. This company is now entering actively upon the manufacture of switchboards, flush receptacles, fan motors and other electrical apparatus, much of which has been designed by Mr. H. O. Swoboda, who for many years was known as the designer for the General Incandescent Arc Light Company, of New York. The company are now employing fifty men, and have arranged to double their facilities by the first of the coming year, when they will have one or two additional floors of their building ready for occupancy.

A suit has been filed in the Circuit Court at Newport, Ky., by C. L. Raison, Jr., for himself as a stockholder and bondholder, for the appointment of a receiver for the Suburban Electric Company, of Covington, to wind up its affairs. The petition alleges that the company undertook to acquire property of another company (Covington Gas Company, which was sold by the Council), and had no funds to pay for it, had it acquired it. The floating debt of the company is said to be about $20,000.

How the American Steel and Wire Company Was Formed.

[*From the Chicago Post.*]

John W. Gates told a party of friends how he happened to get back into active business after he had cleared up a big fortune from the sale of his Federal steel and other interests and had made up his mind to retire. The story was not told in a boasting spirit, but the recital was nevertheless one of live interest as illustrating the whirlwind methods employed in organizing a gigantic enterprise and getting it under way.

Mr. Gates and Colonel Elwood had realized a "bunch of millions" out of Federal steel, and the former had laid his plans for a trip around the world with his wife, having gone so far as to invite a party of friends to accompany them and fix the date of departure. One day while sitting in his office in Chicago chatting with Colonel Elwood he was called up on the long-distance telephone by an acquaintance in Pittsburgh, advising him that the owners of a big wire milling company had fallen out among themselves and would sell. "If you want to make a trade bring on $1,000,000 and I think you can get the property," said the man at the other end of the wire. Inasmuch as the mills were worth at least $2,000,000 the temptation was strong to buy them. The two millionaires who had just laid down business cares concluded to take the property "for a flyer."

The next evening they were in Pittsburgh, and snugly reposing in Mr. Gates' cardcase was a certified check for $1,000,000. They had an all-night session with the owners of the wire mills, and at 5 o'clock in the morning they had the property and the former stockholders carried off the big check. The party repaired to the Duquesne Club for refreshments. There they met the proprietor of a big wire mill up the state, and to him the story of the night was told.

"If you fellows have money to burn you'd better buy my mills," he said, banteringly.

"What will you take for them?" responded Mr. Gates.

"Nine hundred thousand dollars," was the answer.

"It's a go," said Mr. Gates, quick as lightning, and a deal involving nearly $1,000,000 was closed in less than sixty seconds.

The two Chicago men then communed briefly, and Colonel Elwood remarked: "John, if we are going into the wire business we must have a base of supplies. Better see if we can't buy the Cleveland Rolling Mills."

Taking the first train out of Pittsburgh, they proceeded as fast as steam could take them to the city on the lake. That evening they broke in on the owner with the blunt statement that they had come to buy his property, which included rolling mills, steamships, docks, iron and coal mines, etc.

"But I don't want to sell," he protested. "Still," he said, hesitatingly, "I would like to hear your proposition. What are you prepared to offer?"

"Five million dollars cash," was the reply. And then Mr. Gates added: "Five million dollars is a big bunch of money. Better think it over."

"I want more money," expostulated the Cleveland man.

"We will give you $5,000,000 and not a dollar more."

The gentlemen met later in the evening and before midnight the trade was closed, the old owners stepping out and the new stepping in. The "cleaning up" yielded $2,540,000 in cash, so that the property really cost Gates and Elwood $2,550,000. It was worth from $7,000,000 to $8,000,000 without the cash. The next morning the *Cincinnati Enguirer* had the story of the Pittsburgh deal, and the telegraph brought an offer of some valuable wire plants in and near the city. Mr. Gates repaired at once to Cincinnati, and Colonel Elwood hastened East to negotiate for valuable plants in Massachusetts. Forty-eight hours later they met in New York and on comparing notes found they had invested $12,000,000 of their cash in wire plants. All that happened during the week between Christmas and New Year, less than eleven months ago.

"It looks as though we were in the business," said Mr. Gates.

"A fair nucleus," responded Colonel Elwood. "Let us go home."

They cannon-balled to Chicago, and in less than another week arrangements were practically consummated for the giant consolidation known as the American Steel and Wire—capital, $90,000,000. January 18, or a little over three weeks from the date of that long-distance telephone conversation between Chicago and Pittsburgh, the constituent properties were duly turned in, and the S. and W. stock was distributed according to arrangement.

This, in brief, is the inside history of one of the "lightningest" deals for its magnitude ever negotiated. It was a Napoleonic campaign from start to finish. It is not recorded that either Mr. Gates or Colonel Elwood lost money on the transaction. Mr. Gates called off that trip around the world.

BOOK REVIEW.

The *Electrician* Electrical Trades' Directory and Handbook for 1900. Cloth. The *Electrician*, London, publisher. Ready in January, 1900. Supplied by the ELECTRICAL REVIEW at $5.

This is a new edition of the well-known "Blue Book," or directory of the electrical trades. It contains a carefully compiled and corrected list of British, colonial and foreign electricians, electrical engineers, electric light and power and traction engineers and contractors, electrical apparatus makers, plant and machinery builders, electrical, telegraph and scientific instrument makers, electric bell makers and fitters, electricity supply, telegraph and telephone companies, telegraph and telephone engineers, electric cable and wire manufacturers, and of all persons engaged in electrical pursuits throughout the world; useful tables and data relating to electric light and traction, electric power transmission, electricity supply companies, telegraphs and telephones, home and foreign government departments, etc., and a biographical section, giving interesting particulars of the careers of about 300 eminent men connected with electricity in all its applications, with many portraits. To American manufacturers seeking information concerning foreign markets the book is of great and permanent value. The American section is good, but the greatest value of the work is in its information about foreign electrical concerns, all of whom are prospective customers.

Telegraph Facilities in the Klondike.

The Postal Telegraph-Cable Company announces that it is now prepared to accept telegrams for the following named points in Alaska, British Columbia and Northwest Territory: Glacier, Log Cabin, Middle Lake, Shops, Skagway and Summit, Alaska; Bennett, British Columbia; Caribou Crossing, Dawson City, Five Fingers, Fort Selkirk, Hootalinqua, Lower Labarge, Miles Canon, Tagish and White Horse, N. W. T. Messages are accepted with the understanding that they will be transmitted by telegraph to Seattle, Wash., Vancouver, B. C., or Victoria, B. C., forwarded by first steamer to Skagway, and thence transmitted over government telegraph lines to distination. The steamer service being irregular and slow, messages are subject to delay.

Government Departments and Science.

The subjourned editorial remarks from an English scientific contemporary are not more applicable to the British Government and army, than to our own. "Certainly, not for many years has there been so much anxiety, either expressed or silently borne," says our contemporary, "as since some days ago, when the wire joining Ladysmith and civilization was broken. Not only have the relatives of the 10,000 Britons beleaguered there been anxious, but all who take interest in the severe struggle which is now going on. It has been a matter of general surprise that in a campaign in which the cutting of telegraph wires was the first thing to be expected, and the investment of several isolated garrisons for a time was to be taken for granted, Marconi apparatus was not installed as a matter of course. We do not share this surprise; science, and especially the latest developments of science, are the last things to interest our government and the government departments; they do not believe in science, they care to know very little about it, and the scientific spirit is absent from too many of their plans and doings. Hence we have now to be thankful that they have reached the level of the pigeon post, which has been the only official means, and that on the part of one or two birds, to keep us in touch with our beleaguered forces. It is stated that even the Commander-in-Chief, Lord Wolseley, has expressed some surprise that the so-called 'intelligence department' of the army allowed the Ladysmith force to go to the front with mountain guns, against a Boer force, which they should have known might be armed with Schneider-Canet cannons of large calibre; and it would seem that probably a terrible disaster has been prevented, not by our intelligence department, not by the outfit of our army, but by the apparently accidental arrival of naval guns and *personnel* at the last moment. Why is there not a scientific committee to do what it can in advising the military authorities? If they could do nothing, nobody would be the worse, but they might be able to do much to the nation's advantage."

Paragraphs from the Electrical Trade.

Stanley & Patterson, 32-34 Frankfort street, New York, are introducing a unique, matchless electric lighter, which operates on either Edison or battery current.

The Connecticut Telephone and Electric Company, Meriden, Ct., has recently completed several new styles of desk telephones adapted for various services and purposes.

The Wagner Electric Manufacturing Company, St. Louis, have recently issued a booklet descriptive of the "Wagner" types of single-phase alternating-current motors.

The American Woven Wire Dynamo Brush Company, Peabody, Mass., are making dynamo brushes of the most approved character, and have facilities to care for orders for special types or sizes.

The National Carbon Company, Cleveland, Ohio, will send a copy, on receipt of inquiry, of a new and elaborate catalogue of carbon specialities, especially including battery cells of both the wet and dry type, for all purposes.

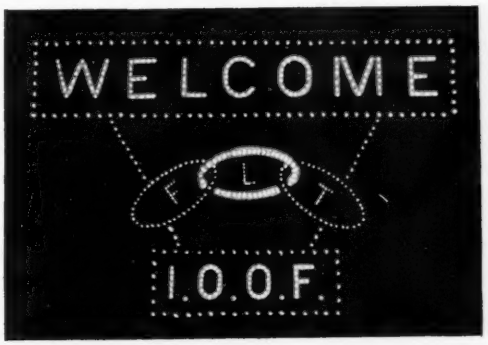
The Michigan Electric Company, Detroit, Mich., are selling agents for the "Imperial" incandescent lamps, made by the Byran-Marsh Company. They advertise to furnish these lamps in greater variety than any other brand of incandescent lamps.

The Fisher Electrical Manufacturing Company, Detroit, Mich., are making a design of circuit-breakers which is said to be meeting with the endorsement of electrical engineers and the practical plant operators. This company are also reported as having a good demand for the standard line of dynamos and motors made in their shops.

"Johns Electric Heaters" is the subject of an attractive little brochure published by the H. W. Johns Manufacturing Company, New York. These heaters are now being widely used in private houses, steamships, street cars, offices and in special adaptations. They are made in a variety of styles, with attractive finish, and are provided with an improved principle of temperature regulating switch.

The American Electric Specialty Company, 123 Liberty street, New York, is having excellent success in the introduction of the improved direct-reading ohmmeter. This instrument is one which has been carefully developed, and is of the highest possible character of construction. This company is the New York agent for the Wirt rheostatic devices, motor brushes, etc., and report an unusually heavy line of sales for the season.

Mr. C. C. Warren, president of the Warren Electric Manufacturing Company, in a recent interview, spoke of the unprecedented call for alternating machinery which their factory was meeting. Reference was made, also, to projected additions, in the way of improved foundry facilities and increased shop room for large tool work, which would greatly add to this Sandusky plant, which, even as it stands, ranks as one of the most complete and modern electrical manufactories in the West.



A Fifty-Foot Electric Sign.

The Morris one-piece rail bond, made by the Morris Electric Company, of New York, is being accepted by many street railroads throughout the country as a marked advance in this line of construction. Twenty-seven miles of electric road in Havana, Cuba, will soon be equipped with this bonding system. The bond is drop-forged in a single piece, and eliminates the using of cast terminals and is designed to overcome any tendency toward electrolysis; 98 per cent of conductivity is said to be the capacity of the terminals in each bond, and at the same time the disintergration of the joints is overcome.

A new telephone catalogue has recently been issued by the Central Telephone and Electric Company, 909 Market street, St. Louis, Mo. The catalogue describes many types and styles of exchange and intercommunicating telephone instruments, all kinds of telephone supplies, new parts for old telephones, double-pole receivers, electricians' tools, lightning arresters, carbon and fuse, extension bells, standard and bridging, circuit closers, transmitters of various styles, repeating coils, induction coils, construction material of all kinds. The company wish it announced that they will send this catalogue free to enquirers, and that they have special facilities for attention to orders from western patrons.

The Manhattan General Construction Company, of Newark, N. J., and 11 Broadway, New York, has been meeting with great success in the establishment of its alternating-current series arc lighting system. This system differs from most others in that the loss in the regulator in the lamp circuit is constant at all loads and equal to only 200 watts, while the regulators take care of any percentage of the full number of lamps belonging to their circuits, from ten per cent to one hundred. The lamps themselves are claimed to have a total loss of only 5 watts when running at 6.6 amperes and 72 volts. Their efficiency is said to be as high as 99.00, while their power factor is 91 per cent and the terminal voltage is the same as that at the arc. No springs are used in the construction of these lamps.

Electrical Signs.

The making of electrical signs has been important enough for at least one large electrical house to devote a department to their designing and construction, and it is interesting to note the elaborate and artistic manner in which some of these are made. On Madison Square, New York, it is said that the rental for the space alone for two electrical signs aggregates $18,000 yearly. The Michigan Electric Company, Detroit, Mich., is the company referred to as devoting a department of their establishment for this work. The illustration shown herewith represents one of the company's productions. It was erected on the occasion of a large fraternity meeting, and was 50 feet wide, composed of incandescent lamps of various colors.

Telephone News .....and Comment

The telephone war in Rockford, Ill., due to the application for a franchise for an independent company, has probably been settled by the offer of the Bell company to the City Council committee to reduce rates for business telephones from $42 to $36 a year and for residence instruments from $30 to $24.

The management of the Erie system of telephones has appropriated an additional $10,000,000 for extensions during the years 1900 and 1901. Of this amount $2,000,000 has been allotted to Cleveland, Ohio. Previous appropriations for the Cleveland district, which is comprised of Cleveland and Cuyahoga County, amounted to $3,000,000.

The United Telephone and Telegraph Company, which was recently incorporated in New Jersey with a capital of $5,000,000, has been organized by the election of the following officers: President, Mr. Henry A. Parr; secretary, Mr. P. W. Wilkinson; treasurer, Mr. William H. Emory; directors, Mr. Parr, Mr. Alexander Brown, Mr. Thomas J. Hayward, Mr. S. Davies Warfield, Mr. James Bond and Mr. John Headden, 3d, of Jersey City. The details of the absorption of the Maryland Telephone and Telegraph Company and the Pittsburgh and Allegheny Telephone Company have been discussed, but nothing definite has been decided upon.

The telephone has become a necessity of modern life, and whatever tends to cheapen the telephone service and enlarge its sphere of operations deserves support and encouragement. There has been a rapid increase of independent telephone companies. It is stated that the close of this year will see 3,500 independent telephone exchanges in operation, having over 750,000 instruments. In 1880 there were under rental use in the country 60,873 telephones. One year later the number had increased to 132,692. In 1898 the number of telephones in use was over 1,000,000. In 1885 there was in use in the various systems and modes of building 137,223 miles of telephone wire. At the beginning of this year the mileage had increased to 1,158,000 miles. The use of the telephone is more common in the United States than in any other country.—*Leslie's Weekly.*

Manhattan Railway Company's Electrical Equipment.

President George J. Gould, of the Manhattan Railway Company, stated on November 29, after the Executive Committee meeting, that a contract had been awarded to the Westinghouse Electric and Manufacturing Company for the heavy generating machinery for the new power house and apparatus for substations which, with the contracts already given for engines, boilers, etc., practically completes the material required for the stationary installation of the electrical equipment of the system. Mr. Gould added that the first of the large dynamos was due for delivery in ten months from date. The electrical contract involves between $1,500,000 and $2,000,000. An official statement issued by the Manhattan Railway Company is, in part, as follows:

The apparatus covered by the contract awarded to-day consists of eight three-phase alternating-current generators, each of 6,650-horse-power capacity, together with such step-down and converting devices for the substations as will be necessary to transform the alternating current generated in the power house into direct current at 500 volts, which direct current will be fed to the third rail of the elevated system. The 6,650-horse-power generators will be the largest ever designed or constructed, their external dimensions being something over 40 feet, while the rotating element, which includes in itself the rotating field of the generator and the necessary flywheel for the engine, and which will be mounted directly upon the shaft of the engine, has a diameter of 32 feet.

Some idea of the enormous size of these generators may be gained from their dimensions and from the fact that the weight of each machine and engine complete is nearly 1,000 tons. The current generated by these large machines will be conveyed to various substations conveniently located about the city, in which substations will be installed 26 rotary converters in units of 2,000 horse-power each. These rotary converters are designed to produce direct current of 500 volts, for use upon the elevated structure.

The Manhattan Railway Company has been actively studying the problem, which to-day culminates in awarding this contract, for over two years, and has taken every possible precaution to arrive at a correct decision in this important matter. The Technical Board of the Manhattan Railway Company is composed of men prominent in engineering matters, and who are authorities and experts in their respective lines.

The ELECTRICAL REVIEW predicted in its issue of October 11, 1899, that the Westinghouse Company would secure the contract for the power-house equipment. As already announced, the contract for the engines has been awarded to the Edward P. Allis Company, of Milwaukee, and that for the boilers to the Babcock & Wilcox Company, of New York. It is expected that at least a part of the road will be in operation by electricity within a year.

American Bell Telephone Company's Output.

The instrument statement of the American Bell Telephone Company for the month ended November 20, 1899, shows:

	1899.	1898.	1897.
Gross output	69,117	35,159	29,023
Returned	19,992	15,486	7,817
Net output	49,125	19,673	21,206
Since December 20:			
Gross output	608,715	313,522	214,897
Returned	183,263	135,568	84,068
Net output	425,452	177,954	130,829
Total outstanding	1,550,702	1,097,475	904,678

For the month ended November 20, the American Bell Telephone Company put out the largest number of instruments in a single month in the history of the company, 69,117. This is also a noteworthy month by reason of the fact that the number of instruments outstanding crosses the 1,500,000 mark. The month of March this year holds the record for the largest net output for any one month; namely, 53,503 instruments. The net output for November was 49,125. Last March the company was 10,000 instruments behind its orders, but last month the company received orders for 51,000 instruments, and put out 67,000.

Telephone Consolidation in Baltimore.

A recent press dispatch from Baltimore, Md., states:

It is understood that negotiations are pending for a consolidation of the United Telephone and Telegraph Company, which was recently incorporated by Baltimoreans under the laws of New Jersey, and the Federal Telephone and Telegraph Company, which also has a New Jersey charter. The former company has a capital stock of $5,000,000, and the Federal Telephone and Telegraph Company a capital stock of $10,000,000. Messrs. Alexander Brown & Sons are said to be conducting the negotiations on the part of the United Telephone and Telegraph Company.

It is understood that the negotiations are far advanced and that the actual consolidation is a question of only a few weeks. The United Telephone and Telegraph Company will absorb the Maryland Telephone and Telegraph Company, the Pittsburgh and Allegehny Telephone and Telegraph Company, and plants in Wilmington, Del., Alexandria, Va., and Jersey City, and will establish service in Philadelphia, Washington and other cities. The officers of the company are Messrs. Henry A. Parr, president; P. W. Wilkinson, secretary, and William H. Emery, treasurer. The directors are: Messrs. Henry A. Parr, Alexander Brown, Thomas J. Hayward, S. Davies Warfield and James Bond, of Baltimore, and John Headen, third, of New Jersey.

Wall Street and the Electrical Stock Market.

The stock market in Wall street closed the week with a very firm undertone, and in certain quarters conspicuous strength was apparent. Among the firm features was Manhattan Railway, regarding which considerable information was given in the last issue of the ELECTRICAL REVIEW. For the closing week of the month the usual statements of earnings for the previous month indicated that the business of the country is still in unprecedented volume. While the situation is more favorable, yet the money market can not properly be regarded as easy. On Thursday the Bank of England advanced the minimum rate of discount from 5 per cent to 6 per cent, and if this is maintained it is not improbable that it may lead to exports of gold to London.

On the New York Stock Exchange General Electric closed to-day at 129½ bid and 130 asked, a loss of 1¾ points. Metropolitan Street Railway, of New York, closed at 193 bid and 193½ asked, a loss of 1¼ points. Third Avenue Railroad, of New York, closed at 151½ bid and 154 asked, a gain of ½ point. Brooklyn Rapid Transit closed at 86⅛ bid and 86¼ asked, a loss of 2 points. Manhattan Railway, of New York, closed at 105½ bid and 105¾ asked.

On the Boston exchange American Bell Telephone closed at 350½ bid and 355 asked, a loss of 3 points. Interesting news about American Bell Telephone is published in another part of this issue of the ELECTRICAL REVIEW. Erie Telephone closed at 108 bid and 109 asked, indicating no change.

On the Philadelphia exchange Electric Storage Battery closed at 117 bid and no asked price, a loss of 3 points in the bid price. Union Traction closed at 41½ bid and 41⅝ asked, a loss of ¼ point. Electric Company of America closed at 14½ bid and 14⅝ asked, a gain of ¼ point.

On the curb or outside market in New York Electric Vehicle closed at no bid price and 75 asked, a loss of 5 points. Electric Boat closed at 24 bid and 26 asked, a gain of 2 points. Electric Axle closed at 5⅞ bid and 6⅜ asked, a loss of 1⅛ points.

Wall Street, December 2.

Mr. Henry M. Whitney denies that he has any interest in the proposed consolidation of the Consolidated Street Railway Company, Worcester, Mass., and the Worcester Electric Light Company, or that he is interested in a movement headed by J. Edward Addicks to form a gas company in opposition to the Worcester Gaslight Company.

Superintendent of Fire Alarm Telegraph, of New York.

In March of last year, Fire Commissioner Scannell abolished the office of Superintendent of Fire Alarm Telegraph and Electrical Appliances in the Fire Department of the city of New York, and the incumbent, J. Elliot Smith, was removed. At the same time the office of Superintendent of Fire Alarm Telegraph in Brooklyn was abolished, and the incumbent, Henry F. Blackwell, Jr., was assigned to duty under the title of Assistant in Charge of Fire Alarm Telegraph in the boroughs of Manhattan and the Bronx, Brooklyn, Queens and Richmond, with directions to report to the Chief of Department for instructions. Mr. Smith at once served notice on the Commissioner that he was advised that the abolition of the office that he formerly occupied did not operate as a removal of him from the Department, and that he was entitled to continue the performance of his former duties under whatever name the present office is conducted, and asked that he might be restored to active service, in such position, and reported that he held himself in readiness for orders. The request was denied, and the case carried to the court.

November 25 Judge Gildersleeve, in Supreme Court, issued a peremptory writ of mandamus, delaring that the allegations of the alternative writ of mandamus, with regard to the abolition of the office held by the relator are true, and that Mr. Smith was entitled to be restored to the office of Superintendent of Fire Alarm Telegraph and Electrical Appliances, in the Fire Department of the city of New York, and entitled to recover arrears of salary amounting to $3,656.75, together with the costs of $129.48.

Superintendent Smith's many friends in and out of New York are congratulating him upon this decision.

The Chicago Union Traction Company's purchase of the Yerkes interests in the suburban lines composing the Chicago Consolidated Traction Company, which was announced last week, will be followed in a very short time, it is said, by the purchase of the Yerkes interests in the Suburban Railroad Company. The capital stock of the Suburban road is $1,250,000, and there are five per cent gold bonds to the same amount outstanding. Mr. Yerkes's holdings of Consolidated Traction amounted to about $10,000,000.

Facilities for Handling Crowds at the Paris Exposition.*

The administration of the Paris Exposition, basing its estimate on the number of tickets put out and sold, counts on 60,000,000 visitors. These are crowds really disquieting, even considering simply the circulation, for in reality the area of the exposition is insignificant. Moreover, on account of the unexpected demands of exhibitors, the amount of space necessary for handling crowds has been greatly reduced. Look, for example, at the Esplanade des Invalides. It is now only a narrow passage. It is the same on the Quai d'Orsay, which, nevertheless, on account of its situation as a connecting link between the esplanade and the Champ de-Mars and the foreign structures on it, will be the favorite passage of visitors. If only the quay had been reserved for the exposition it would not have been so bad, but it was not possible to suppress the streets which cut through it, such as the Avenue La Tour-Maubourg, Avenue Rapp and Avenue Bosquet. Thus, at these points, they have had to be satisfied with installing foot-bridges 15 to 18 feet above the roadways.

Perhaps the foot-bridge over the Avenue Rapp, in 1889, will be remembered. People were literally crushed there. Judge what it will be in 1900 with the number of visitors at least doubled. It is true that parallel with the promenade will circulate the electric railway and the moving sidewalks, but, of course, these are not free means of communication, and the public will not take them merely to go from one side to the other of the foot-bridges. One must confess, however, that the moving sidewalks constitute an innovation which, for the purpose of moving crowds, may render enormous services. It has been calculated that they will have a capacity for 50,000 passengers an hour.

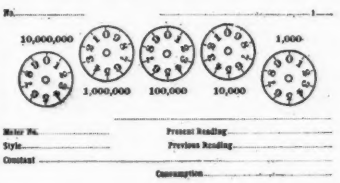
Truly no railroad would be capable of handling such a crowd. It is the Western Railroad Company, the same that is paying for the Alexander bridge, and putting in a new station at the Invalides, which will furnish the electric power for the moving sidewalks and the electric railway. This company is now having built at Issy les Moulineaux, by the General Traction Company and the French Westinghouse Company, a great electric power house destined to supply the new line from Versailles to the Invalides as well as the compressed-air service which will connect the St. Lazare station with the Champ-de-Mars and the Invalides station. The greater part of the electricity produced by this power house will follow subterranean piping established within the Moulineaux Railroad cut which runs alongside the quay d'Orsay. It will be easy for the electric transportation company of the exposition, after agreement with the Western Railroad Company, to take off the power necessary to operate the electric railroad and the moving sidewalks. The Western Railroad Company, for reasons of economy, transmits its electricity in the form of a three-phase current at very high tension while the electric transportation company will use only a continuous current with the relatively low tension of 500 volts. The transformation thus necessitated will be made in a transforming substation. This will be established within the exposition and will itself constitute an attraction and source of instruction for engineers. It will be an application of the new methods which rule in the transmission of electric power; production in power houses perfectly placed of electric currents of very high tension; transmission of this current by copper cables of small diameter, and costing little, and transformation at the point of application into a continuous or three-phase current of low tension. The transforming substation of the exposition will contain four transformers of 600 kilowatts, or 816 horse-power. The railroad, with its seven trains in motion, will take 600 kilowatts; the moving sidewalks will likewise take 600 kilowatts. For each system of transportation there will be one spare unit.

The supply of the railway will present nothing especially novel. The electricity will be distributed by an insulated rail upon which will slide the shoes carried by the cars. For the moving sidewalks, the handling, especially at starting, is much more difficult. It is in a way like putting in motion a train three kilometres (about two miles) long. Great precaution must first be taken that the movement be not too sudden; finally, that the impulse given may have no effect on the operation of the generating machinery.

It has been arranged with the engineers of the Western Railroad Company that the starting will be effected as follows: By means of a little auxiliary machine the transformer will be put in motion and will be run up to its normal speed, that is to say, the speed synchronous with the three-phase current at 5,000 volts of the power house at Moulineaux. At a certain moment the motors placed under the sidewalks, and operating them by friction, will exert sufficient force, and the platform will move off with very slight speed at first, then with an increasing speed, until it attains the regular speed of 4¼ kilometres (2½ miles) an hour, and for the second of 8½ kilometres (5 miles).

The Moulineaux power house deserves a detailed description. It will certainly be one of the finest in the world. It will include, by the end of 1900, nine units of 800 kilowatts, or nearly 10,000 steam horse-power. The steam engines will be horizontal and of slow movement. Each of them will operate directly a three-phase alternator of 800 kilowatts and 5,000 volts. One difficulty that the alternators presented was their coupling, that is the connection with the same cable of their output so as to attain 1,600 kilowatts, 2,400 kilowatts and so on by multiples of 100 kilowatts. But at Issy-les-Moulineaux all arrangements have been made so that the coupling of these alternators may be done in a rapid and reliable manner.

*Translation in abstract by the *Railway and Engineering Review*, from *Le Chemin de Fer*.



SHEET FROM A METER RECORD BOOK (REDUCED FAC-SIMILE).

American Street Railway Association.

The report of the eighteenth annual meeting of the American Street Railway Association, held at Tattersall's, Chicago, October 17 to 20, 1899, containing a steel-plate portrait of the retiring president, Mr. Charles S. Sergeant, of Boston, has been issued. Secretary Penington is to be commended for his promptness in issuing the report.

"I noticed in an advertisement in the ELECTRICAL REVIEW the other day, a bully catch-line," said a man who devotes his time to getting publicity for other people. "It was this: 'Light diffused is light well used.' That sentence means a whole lot and I should strongly advise the advertiser to adopt it as a trade symbol and 'diffuse' it."

A Meter Record Book.

"The Meter Record Book," published by the Western Electric Company, Chicago, contains 250 sheets, three on the same page and perforated so that they may be torn out. Each form is numbered consecutively. There are four sets of books numbered from 1 to 4. In Book 1, the forms are numbered from 1 to 250; in Book 2, from 251 to 500; in Book 3, from 501 to 750, and in Book 4, from 751 to 1,000. The meter man marks on the fac-simile of the dial, with a lead pencil, the exact position of the hand on the meter dial. The form is returned to the office, proper extension made, and the slip filed for reference. In some instances where different methods of taking records of meters are used, the man who reads the meters carries a book of this description in his pocket and leaves the record of the meter readings with the customer. The illustration herewith shows one-third of the sheet in miniature. The sheet is 5½ by 3 inches in size, and the diameter of the meter dial is ¾-inch.

Electric Lighting Litigation.

The Appellate Division of the Supreme Court in Brooklyn, N. Y., has handed down an opinion reversing the decision of the lower court, which granted an injunction restraining Henry S. Kearny, Commissioner of Public Buildings, Lighting and Supplies, from entering into contracts for lighting the streets and public buildings without the consent of the Municipal Assembly. The decision dissolves the injunction, and now Commissioner Kearny may enter into a contract for the lighting of the streets and public buildings. Pending the result of the appeal, the electric lighting and gas companies have been furnishing lights without a contract.

Reduced Cable Rates to Cuba.

The Western Union Telegraph Company announces that on and after December 1, 1899, its rate on telegraphic messages between Havana, Cuba, and New York and all places east of the Mississippi River, including St. Louis and Minneapolis, will be 15 cents a word; and that the rate with all other places west of the Mississippi River will be 20 cents a word. The present rates are, respectively, 25 and 35 cents a word. The company adds that it has just completed the laying of a new three conductor cable between Miami, Fla., and Key West, Fla., and a new cable thence to Havana.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

ALBANY, N. Y.—The Rochester Telephone Company, with a capital of $100,000, has been incorporated. The general route of the company, besides operating in Rochester, will connect with Syracuse, Utica, Oswego, Watertown, Ogdensburg, Buffalo, Niagara Falls, Mayville, Corning, Elmira and Binghamton.

SAN FRANCISCO, CAL.—The Martel Power Company has been incorporated to generate power, light and heat; capital, $100,000; incorporators, A. F. Martel, E. F. Sagar, M. D. Levenson, J. Newbauer, E. Martel, B. A. Goldsmith, A. I. Black, all of San Francisco.

MT. VERNON, IND. — The Posey County Telephone Company has been incorporated to operate telephone lines; capital, $10,000; incorporators, W. M. Fird, W. M. McGregor, E. Reed, J. Bailey, all of Mt. Vernon.

TIFTON, GA. — A new telephone line is soon to be built from this place to Ashburn.

WATERBURY, CT.—The Waterbury Automatic Telephone Company has been incorporated; capital, $10,000; incorporators, G. F. Hughes, M. J. Byrne, W. L. Hall, W. D. Richardson, W. S. Jones, J. Blair, all of Waterbury; B. F. Mahon, of New London.

NEW YORK, N. Y.—A fourth telephone company, to be known as the Universal Telephone Company, has been organized to do business in this city. The capital stock is $5,000,000.

ALBANY, N. Y.—The Independent Telephone Company, of New York city, was recently incorporated here. Its capital stock is $100,000, which may be increased to $20,000,000. The directors are Frederick Myers, James Russell, C. W. Phillips, Henry Teneyck Wendell, of New York, and Franklin Noble, Charles Tremaine and James C. Merwin, of Brooklyn.

Electric Light and Power.

RUTLAND, ILL.—S. Milliken, of Walnut, Ill., has been granted a 20-year franchise by the village board, and will at once install a complete electric light plant. The village street will be illuminated with 16 2,000-candle-power arcs.

HAZELHURST, MISS.—The Hazelhurst Electric Light Company has been incorporated; capital stock, $5,000; I. N. Ellien and G. T. Ragsdale, incorporators.

GILLMAN, ILL —A franchise has been granted to F. L. West for installing an electric light plant at this place.

PETALUMA, CAL.—The St. Helena Pure Water, Electric Light and Power Company has filed articles of incorporation with the County Clerk of Napa County. The capital stock consists of 125,000 shares at par value of $1 each.

LIGONIER, PA.—The Byers-Allen Lumber Company, of this place, is contemplating the erection of an electric light plant in its factories.

VALLEY STREAM, L. I.—A movement is on foot here to again introduce the electric light, and petitions are now being circulated for the necessary signatures.

NORWICH, CT.—The Aldrich Manufacturing Company is preparing to light its large plant in Moosup by electricity. A large dynamo, capable of sustaining 1,000 lights, will soon be put in position.

SING SING, N. Y. — The Sing Sing Lighting Company has been incorporated to supply gas and electricity in Sing Sing and other towns and villages of Westchester County. Capital, $50,000; directors, John T. Kirk and B. F. Williams, of Brooklyn, and L. B. Lampman, of Coxsackie.

MCADOO, PA.—An electric light plant is to be erected here at a cost of $5,000.

CHARLEROI, PA.—The West Side Light, Heat and Power Company has been chartered with a capital of $1,000. W. M. Murdock is the treasurer.

MUSCODA, FLA. — Muscoda is to have an electric lighting system of about 600 lamps. The plant will be operated by water-power, located at the mill situated on a lake about three miles from Muscoda.

PINE BLUFF, ARK.—An ordinance has been adopted authorizing the expenditure of $90,000 for the purpose of providing the city of Pine Bluff with arc and incandescent lights for a period of fifteen years.

CHICKASHA, IND. TY.—Chickasha will have an electric light plant.

New Incorporations.

MINNEAPOLIS, MINN.—The G. W. Frey Company has been incorporated; capital stock, $15,000, for the purpose of manufacturing lighting apparatus.

BOSTON, MASS.—The Clark Telephone and Telegraph Manufacturing Company has been incorporated to manufacture and deal in telephone and telegraph apparatus; capital, $100,000; incorporators, D. J. O'Connell, L. A. Frink, F. O. Emerson, J. M. Conlan, E. L. Tierney, all of Boston, Mass.

NEW YORK, N. Y.—The American Power Transmission Company has been incorporated to manufacture and deal in heat, light and power; capital, $500,000; incorporators, S. A. Bennett, A. S. Fisher, T. N. Riprom, L. R. Mestaniz, E. F. Perry, all of New York city.

ST LOUIS, MO.—The Ariel Electric and Manufacturing Company has been incorporated; capital, $3,000; incorporators, J. M. Lanigan, C. S. Broadhead, J. Dryer, all of St. Louis.

CHARLOTTE, MICH. — The Charlotte General Electric Company has been incorporated; capital, $40,000; incorporators, J. C. Farrar, W. Farrar, W. H. Halleck, E. Halleck, H. A. Homes, all of Brighton.

KOKOMO, IND. — The La Clede Battery Company has been incorporated for the manufacture and sale of batteries and electrical supplies; capital, $25,000.

LOS ANGELES, CAL. — The Los Angeles Incandescent Vapor Light Company has been incorporated to manufacture incandescent lights; capital, $100,000; incorporators, J. F. Turner, M. J. Blaisdell, E. Hill, C. H. De Voll, all of Los Angeles; C. H. Herrington, of San Jose.

New Electric Railways.

GALESBURG, ILL.—The Galesburg & Monmouth Rapid Transit Company has been incorporated; capital, $200,000; incorporators, F. Seacord, of Monmouth; H. Knowles, R. Chappel, both of Galesburg.

NORFOLK, VA. — The Hampton Roads Development Company has been chartered at Portsmouth with a capital of $300,000. The company proposes to build an electric railroad from Portsmouth to Pig Point, on Nasemond River, opposite Newport News; operate a ferry across the James, and build a town at Pig Point. Parties closely connected with the Seaboard Air Line Railway are believed to be behind the project.

OIL CITY, PA.—The Citizens' Traction Company has been incorporated; capital, $150,000; incorporators, W. Hasson, D. G. Geary, H. I. Beers, P. Boyle and E. Liebel.

GUTHRIE, O. T.—A charter has been issued for the construction of an electric line between the cities of Shawnee and Tecumseh, in Pottawatomie County.

TACOMA, WASH. — Rydstrom & Goerig have been awarded the contract for constructing the Tacoma-Seattle Electric Railway.

Increase of Capital.

LORAIN, OHIO—The Lorain Street Railway Company has increased its capital stock from $200,000 to $750,000.

BEAVER FALLS, PA.—The Pennsylvania Telegraph and Telephone Company, organized to do business in the towns of the Beaver Valley, has increased its capital from $50,000 to $150,000.

William Lardner, of Deadwood, S.D., has sold to the Cascade Water-Power and Electrical Transmission Company fifteen miles of water rights on Spearfish Creek. The consideration was $100,000. The Cascade Company proposes to put in a gigantic electric plant to furnish power and light for the Black Hills.

American Institute of Electrical Engineers.

At the last meeting of the Council of the American Institute of Electrical Engineers, the following associate members were elected:

E. C. Baugher, engineer of construction, Westinghouse Elec. & M'f'g. Company, 120 Broadway, New York; Frank George Baum, assistant to chief engineer (Dr. F. A. C. Perrine), Standard Elec. Company, of California, 23 Nevada Block, Cal.; Louis W. Downes, vice-president and general manager, The D. & W. Fuse Co., Providence, R. I.; Clifton V. Edwards, attorney-at-law and solicitor of patents, 220 Broadway, residence, 114 W. 114th street, New York; Geo. H. Gibson, assistant editor *Engineering News*, 220 Broadway, residence, 209 E. Fourteenth street, New York city; Louis T. Grant, general manager, The Hilo Electric Light Company, Box 160, Hilo, H. I.; Arthur James Hanson, Lawrence & Hanson, 3 Wynyard street, residence, Drunnmoyne, Sydney, N. S. W.; Martin J. Insull, second vice-president and general manager, General Incandescent Arc Light Company, New York, residence, 262 W. Eighty-third street, New York city; E. D. Jackson, engineer, Youngstown Telephone Company, Youngstown, O.; W. O. Layman, assistant manager and treasurer, Wagner Electric Mfg. Company, 2017 Jackson street, St. Louis, Mo.; John Lundie, 52 Broadway, New York city; Chas. William Pen-Dell, post-graduate student, Massachusetts Institute of Technology, 207 W. Newton street, Boston, Mass.; Chas. B. Raub, electrical engineer, engineer corps, Newport, R. I.; residence, New London, Conn.; Allen Davidson Roberts, electrical inspector, city council, Kingston, Jamaica; H. A. Russell, sales agent, General Electric Company, residence, 302 Laurel street, San Francisco, Cal.; Ferdinand Schwedtmann, general superintendent, Wagner Electric Mfg. Company, 2017 Locust street, St. Louis, Mo.; Hewlett Scudder, Jr.; assistant to Professor Henry M. Howe, residence, 21 E. Twenty-second street, New York city; Joseph Suydam Stout, Jr., inspector, Edison Electric Illuminating Company, residence, 35 East Sixty-seventh street, New York city; Clinton Eugene Whitney, draughtsman, with Geo. T. Hanchett, residence, 61 W. 114th street, New York city; C. M. Wilkes, engineer, D. H. Burnham & Company, 1142 The Rookery, Chicago, Ill.

The following associate members were transferred to membership:

Cummings C. Chesney, chief electrical engineer, Stanley Electric Mfg. Company, Pittsfield, Mass.; Capt. Achilles de Khotinsky, late chief electrician and torpedo officer, Imperial Russian Navy, Northern Electric Company, Madison, Wis.

Kindred.... ...Interests

The United States Battery Company has announced that hereafter it will discontinue the exchange system formerly in vogue.

The Electric Appliance Company, Chicago, are announcing Packard's moguls and sign lamps for holiday and decorative lighting.

The Cutler-Hammer Manufacturing Company is now nearly settled in its new factory, in Milwaukee, and is in position to fill all orders promptly. The increased space will enable the company to meet in every way the growing demand for the Cutler-Hammer rheostat.

The Federal Battery Company, of New York, report that they are pushing their Federal battery salts for electric clock work. Batteries on the Boston & Maine Railroad charged with Federal salt are stated to have lasted over two months longer than sal ammoniac doing this kind of work.

The Sterling Electric Company, of Chicago, say they are meeting with success on every hand in the sale of Sterling bell apparatus and telephones. Their new factory at Lafayette, Ind., will greatly increase their capacity, and enable them to take care of their large business in better shape.

The Belknap Motor Company, Portland, Me., have just closed two orders for their Chapman voltage regulators. One is to be installed in the station of the Suburban Electric Company, Elizabeth, N. J., and the other in the station of the Poughkeepsie, N. Y., Electric Light and Power Company.

The Peru Electric Manufacturing Company, of Peru, Ind., report an unusual activity in sales during the past two months. The prospects for a still greater increase are so flattering that they have been compelled to increase the facilities for the manufacture of their goods, and are engaged in the work at this time.

The Hays Construction Company, of Troy, Ohio, makes a specialty of putting on a paying basis broken-down electric light, power and street railway plants, and has met with pronounced success in this line. Mr. W. S. Hays, general manager of this company, says it will not be long before they will have to seek larger quarters.

The Speer Carbon Company, St. Mary's, Pa., requests the ELECTRICAL REVIEW to state that in the article on "Carbon Making," which appeared in the last issue of this journal, the titles of several illustrations were transposed. Any one familiar with carbon making would, however, readily recognize the transposition.

The Garton-Daniels Company, Keokuk, Iowa, has been incorporated to continue the business of the Garton-Daniels Electric Company. It is the intention of the new company to add other specialties to its line of manufactures, announcement of which will be made later. With increased capital and better facilities the company will be better equipped than ever to handle the remarkably increasing demand for Garton Lightning Arresters.

The Chicago Edison Company's Repair Shops, at 76 Market street, Chicago, are doing a large business in repairs of all kinds of electrical apparatus. This company, whose shops are open day and night, have expert workmen and modern machinery to handle repairs, and every order receives prompt attention. Their work meets with universal satisfaction, and correspondence is solicited regarding all electrical apparatus out of repair.

Good blotters that will absorb and not transfer ink are novelties. The Central Electric Company, Chicago, believes in good products, and lately secured a special mill order of extra weight blotting stock, and are now prepared to distribute many thousand blotters each month. These are gotten up with a calendar of each month as issued, and any desiring excellent blotters, who may be overlooked in the distribution, are requested to ask for a free stock.

The Jewell Standard Meters, manufactured by the McIntosh Battery and Optical Company for the Jewell Electrical Instrument Company, of Chicago, are meters of the d'Arsonval type, and are made rigid and strong to withstand the rough usage to which portable instruments are sometimes subjected. Their construction is accurate in every detail, and the company claim they are receiving a large number of orders for them. A descriptive price-list will be mailed on application.

The Western Electric Company's constant-potential enclosed arc lamp for alternating circuits is operated upon the repulsion principle. The practical tests, extending over a period of the past six months, have shown that lamps constructed on this principle are, for many reasons, finely adapted for the special class of service which they are called for. Great changes in voltages and frequency, irregularities in character and size of the carbons, affect the operation of these lamps but slightly. This fact is something that is appreciated both by the station manager operating commercial circuits and by his customer. The demand for Western Electric alternating enclosed arc lamps for constant-potential circuits has steadily increased. The catalogue illustrating these lamps, which is known as the Petite alternating arc lamp, has been distributed to various central stations. Any who have not received a copy of this catalogue will upon request.

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED NOVEMBER 21, 1899.

637,282 Electric insulator; J. A. Poche, New Orleans, La.—A partition having an aperture, a conductor passing centrally through said aperture, an insulating enclosure formed in a single piece surrounding said conductor, extending through the aperture to predetermined distances on both sides thereof, and provided with openings at the ends for the passage of said conductor, which are plugged up around the conductor in an air-and-water-tight and electrically-insulated condition.

637,302 Sparking-igniter for explosive engines; G. S. Strong, New York.

637,313 Apparatus for recutting files by electrolysis; S. Wicks, Cleveland, Ohio—Means to support the files singly and separately, means to adjust said files to any depth desired in the electrolytic, cathode members supported and suspended within pockets in the walls of said apparatus, and electrical connections for said files and cathode members.

637,318 Burglar alarm for windows; R. Baumann, St. Louis, Mo.

637,321 Electric massage instrument; Louis Casper, Chicago, Ill.—Means for producing a rolling massage action, means for producing a tapping or striking action, and means for producing an electrical action on the skin through the parts employed for massaging.

637,323 Electrical switchboard; Chas. Cox; Liverpool, England.

637,349 Alternating-current electric motor; C. L. Rosenquist, Birmingham, England.

637,388 Automatic weighing scale; E. Hanak, Sacramento, Cal.

637,409 Electric protector for buildings; J. A. Poche, New Orleans, La.

637,414 Electric signaling apparatus for rail or tramways; F. W. Prokov, Berlin, Germany.

637,422 Galvanic battery; C. B. Schoenmehl, Waterbury, Ct.—Consists of a basket of pockets formed against said basket, and having walls upon all sides, insulating supporting-blocks retained in said pockets and a positive element supported on said blocks.

637,448 Electric arc lamp; W. J. Davy, London, Eng.—Means for securing the enclosing bell in positions consisting of a bottom yoke supported from the frame of the lamp, the cross-bar fitting in notches in the yoke, the stud screwing in to the cross-bar, the lower carbon-holder secured to the transparent bell, and a spring within the stud and on which the carbon-holder rests.

637,453 Telephone transmitter; E. F. Frost, U. S. A.—Consists of a diaphragm, an electrode mounted thereon, a chamber enclosing said electrode, and an electrode therein inclined to the first, a granular conductor partially filling said chamber and between said electrodes.

637,454 Electric clock; F. I. Getty, Chicago, Ill.—Consists of a driven shaft or arbor of the clock train, two levers having pawl-and-ratchet connections with said arbor to actuate the same by gravity, an electromagnet having an armature operatively connected with said levers to alternately lift the same, an energizing-circuit for said magnet, and means for making and breaking said circuit at the termination of the downward movement of each lever.

637,457 Electrical house-wiring; E. T. Greenfield, New York, N. Y.—A system of electrical house-wiring consisting of one or more electrical conductors surrounded by a metallic armor, with rigid means of support permanently secured to a wall, ceiling or other surface, said metallic armor being self-compensating for variations in heat and cold.

637,473 Motor-wattmeter for three-phase alternating currents; J. A. Mullinger, Nuremburg, Germany.

637,474 Circuit breaker; D. L. Moore, Jr., Philadelphia, Pa.

637,538 Antiseptic device for sound-transmitter mouthpieces; G. W. Van Alstyne, Los Angeles, Cal.—Comprises a cup formed of antiseptia gauze returned upon itself at the edge of said cup to form a channel to fit upon and chamber the rim of the mouthpiece.

637,585 Electroplating apparatus; Edw. Hett, New York, N. Y.

637,613 Cloth-cutter; Pat. Howe, Boston, Mass.—A motor, a spider removably secured to one end of the motor and having an extended central hub, the armature-shaft of said motor being journaled in said hub, a cutter-shaft and its cutter, gearing connecting said shafts, said cutter-shaft being journaled in a hanger adjustably connected to said hub.

637,635 Mantle for electric-arc lamps; P. Mersch, Paris, France—A mantle for carbon electrodes consisting of a composition of clay, alumina and kaolin.

637,676 Game played with mechanical figures; R. H. Shaw, Newton Heath, England—A floor with a plurality of inclined areas, a plurality of figures for such areas, a ball, and means for putting a figure into action to act upon the ball and thereby deliver it to another figure substantially the same and adapted to act similarly to the first figure.

637,705 Telemotor apparatus; A. B. Brown, Edinburgh, Scotland—Consists of the transmitting and receiving cylinders and pistons with fluid-pipes connecting said cylinders, the rotary shaft operated by the receiving-piston, the dial, the independently-movable indicating-arms and means carried by the shaft for operating one or the other of said pointers.

637,711 Driving mechanism for dynamos; J. L. Creveling, New York, N. Y.—The combination with the wheels and axles, of a dynamo movably supported in proximity to the axle, means for urging the dynamo towards the axle, intermeshing gears upon the axle and armature shaft, respectively, spacing members near the opposite extremities of the armature-shaft, and cooperating spacing members upon the axle.

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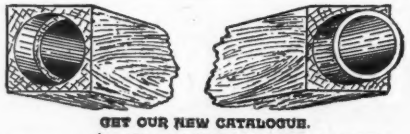

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